

NASA SP-7011 (352)
August 1991

AEROSPACE MEDICINE AND BIOLOGY

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A CONTINUING BIBLIOGRAPHY WITH INDEXES

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 147 reports, articles and other documents originally announced in July 1991 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue are:

STAR (N-10000 Series)	N91-21059 — N91-23072
IAA (A-10000 Series)	A91-32449 — A91-36012

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations include the original accession numbers from the respective announcement journals.

Seven indexes—subject, personal author, corporate source, foreign technology, contract, report number, and accession number—are included.

A cumulative index for 1991 will be published in early 1992.

Information on availability of documents listed, addresses of organizations, and NTIS price schedules are located at the back of this issue.

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TYPICAL REPORT CITATION AND ABSTRACT

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ACCESSION NUMBER → **N91-10591***# Good Samaritan Hospital and Medical Center, ← **CORPORATE SOURCE**
Portland, OR. Neurological Sciences Inst.

TITLE → **ROLE OF ORIENTATION REFERENCE SELECTION IN**
AUTHORS AND → **MOTION SICKNESS Semiannual Status Report**

PUBLICATION DATE → **ROBERT J. PETERKA and F. OWEN BLACK** Sep. 1990 37 p

CONTRACT NUMBER → (Contract NAG9-117) ← **AVAILABILITY SOURCE**

REPORT NUMBERS → (NASA-CR-186612; NAS 1.26:186612) Avail: NTIS HC/MF A03 ← **PRICE CODE**

COSATI CODE → CSCL 06E

Three areas related to human orientation control are investigated:
(1) reflexes associated with the control of eye movements and posture;
(2) the perception of body rotation and position with respect to gravity;
and (3) the strategies used to resolve sensory conflict situations which
arise when different sensory systems provide orientation cues which
are not consistent with one another or with previous experience. Of
particular interest is the possibility that a subject may be able to
ignore an inaccurate sensory modality in favor of one or more other
sensory modalities which do provide accurate orientation reference
information. This process is referred as sensory selection. This
proposal will attempt to quantify subject's sensory selection abilities
and determine if this ability confers some immunity to the development
of motion sickness symptoms.

Author

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

NASA SPONSORED

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ACCESSION NUMBER → **A91-12594*** National Aeronautics and Space Administration. ← **CORPORATE SOURCE**
Ames Research Center, Moffett Field, CA.

TITLE → **CREW SUPPORT FOR AN INITIAL MARS EXPEDITION**

AUTHORS → **YVONNE A. CLEARWATER** (NASA, Ames Research Center, ← **AUTHORS' AFFILIATION**
Moffett Field, CA) and **ALBERT A. HARRISON** (California,
University, Davis) British Interplanetary Society, Journal (ISSN
0007-084X), vol. 43, Nov. 1990, p. 513-518. refs ← **JOURNAL TITLE**

Copyright ← **PUBLICATION DATE**

Mars crews will undergo prolonged periods of isolation and
confinement, travel unprecedented distances from earth and be
subjected to formidable combinations of hardships and dangers.
Some of the biomedical, psychological and social challenges of the
first manned Mars expedition are reviewed and means of aligning
humans, technology and space habitats in the interests of mission
success are identified.

Author

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 352)

AUGUST 1991

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LIFE SCIENCES (GENERAL)

A91-33163

REACTIONS TO HYPOXIA IN HUMANS AND IN ANIMALS DEPENDING ON INDIVIDUAL PECULIARITIES OF THE VEGETATIVE NERVOUS SYSTEM [REAKTSIIA NA GIPOKSIU ORGANIZMA CHELOVEKA I ZHIVOTNYKH V ZAVISIMOSTI OT INDIVIDUAL'NYKH OSOBENNOSTEI VEGETATIVNOI NERVOI SISTEMY]

F. V. OS'MININ, E. I. BARANOVA, A. F. ERSHOV, IU. A. RIABCHUK, A. P. PISANKO (Nauchno-Issledovatel'skii Institut Biologii i Biofiziki, Tomsk, USSR) et al. *Fiziologiya Cheloveka* (ISSN 0131-1646), vol. 17, Jan.-Feb. 1991, p. 95-103. In Russian. refs

Copyright

The effects of hypoxia on the parameters of the gas-transport system in humans and rats were investigated in subjects divided into three groups: sympathotonics (S), parasympathotonics (P), and mesotonics (M). Hypoxic conditions were created by 1-hr-long exposures to simulated altitudes of 3500 m (humans) or 7000 m (rats). It was found that exposures to hypoxia of S subjects caused reactions typical of hypermobilization (including a decrease of tonus in the vagus-nerve nuclei, an increase in the ionotropic heart function, a dilation of brain arteries, and a hyperoxygenation of arterial blood after hypoxia). In contrast, P subjects exhibited hypomobilization-type symptoms. Subjects in the M group reacted to hypoxia by discoordination of the activities of the vascular and the respiratory systems, leading to a decreased work capacity during hypoxia and a delay in oxygen saturation after hypoxia.

I.S.

A91-33173

THE ROLE OF CHANGES IN THE BIOELECTRIC ACTIVITY OF CARDIOMYOCYTES IN THE ANTIARRHYTHMIC EFFECT OF ADAPTATION TO HYPOBARIC HYPOXIA [ROL' IZMENENII BIOELEKTRICHESKOI AKTIVNOSTI KARDIOMIOTSITOV V ANTIARITMICHESKOM EFPEKTE ADAPTATSII K GIPOBARICHESKOI GIPOKSII]

F. Z. MEERSON and V. I. VOVK (AMN SSSR, Nauchno-Issledovatel'skii Institut Obshchei Patologii i Patologicheskoi Fiziologii, Moscow, USSR) *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), vol. 76, Oct. 1990, p. 1298-1303. In Russian. refs

Copyright

The effect of adaptation to periodic hypoxia on the bioelectric activity of rat cardiomyocytes was investigated for both normal and calcium-overload physiological conditions, using measurements in isolated papillary cardiac muscles from control rats and from rats adapted to periodic hypobaric hypoxia. Results on muscles perfused by either physiological buffer or by a buffer containing CaCl_2 showed that adaptation to periodic hypoxia increases the duration of the action potential (AP) in the cardiomyocytes and prevents the depression of the rest potential (RP), the amplitude, and the duration of the AP under high-calcium load and

high-frequency stimuli. At the same time, adaptation significantly limits the contracture of papillary muscles and the depression of the cardiomyocyte RP in a hypocalcium solution. The mechanisms responsible for these adaptation effects are discussed. I.S.

A91-33174

THE DYNAMICS OF OXYGEN TENSION IN THE RAT BRAIN UNDER ACUTE HYPOBARIC HYPOXIA [DINAMIKA NAPRIAZHENIIA KISLORODA V MOZGE KRYSA V USLOVIIAKH OSTROI GIPOBARICHESKOI GIPOKSII]

IU. IA. KISLIAKOV and N. I. POPOVA (AN SSSR, Institut Informatiki i Avtomatizatsii, Leningrad, USSR) *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), vol. 76, Oct. 1990, p. 1368-1375. In Russian. refs

Copyright

The effect of hypobaric hypoxia on the dynamics of oxygen tension, $P(\text{O}_2)$, in the rat brain cortex was investigated using rats fitted with implanted electrodes. The rats were subjected to acute hypobaric hypoxia by being exposed to atmospheric conditions equivalent to those at altitudes of 4000 m (group 1) or 8000 m (group 2). Results of polarographic measurements show that the dynamics of $P(\text{O}_2)$ in the brain cortex under conditions of hypoxia has a phasic character, expressed by successive changes in the $P(\text{O}_2)$ levels, which depend on the degree of hypoxia. The changes in $P(\text{O}_2)$ levels are considered to be induced by systemic and local responses compensating for the shortage of oxygen in air.

I.S.

A91-33175

CHANGES IN RESPONSES OF THE CEREBRAL AND THE PERIPHERAL VESSELS TO BIOLOGICALLY ACTIVE DRUGS UNDER THE INFLUENCE OF HYPERTHERMIA AND HYPOTHERMIA [IZMENENIE REAKTIVNOSTI TSEREBRAL'NYKH I PERIFERICHESKIKH SOSUDOV NA BIOLOGICHESKI AKTIVNYE VESHCHESTVA POD VLIANIEM GIPER- I GIPOTERMII]

V. N. POGORELYI and L. M. GAEVAIA (Piatigorskii Farmatsevticheskii Institut, Pyatigorsk, USSR) *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), vol. 76, Nov. 1990, p. 1576-1580. In Russian. refs

Copyright

The effects of adrenaline, noradrenaline, acetylcholine, histamine, and GABA on the tone of the cerebral and the hindlimb vessels of a cat were investigated (under conditions of autohemoperfusion) during a gradual increase (to 40°C) or a gradual decrease (to 25°C) of the blood temperature. Results show that the specific reactions of both the cerebral and the peripheral vessels to these biologically active substances may change significantly under both types of temperature regimes. Possible mechanisms of these changes are discussed. I.S.

A91-33200*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, AL.

PROTEIN SOLUBILITIES DETERMINED BY A RAPID TECHNIQUE AND MODIFICATION OF THAT TECHNIQUE TO A MICRO-METHOD

ELIZABETH CACIOPPO, MARC LEE PUSEY (NASA, Marshall Space Flight Center, Huntsville, AL), and SIBYL MUNSON (Wisconsin, University, Madison) International Conference on

Crystallization of Biological Macromolecules, 3rd, Washington, DC, Aug. 13-19, 1989, Paper. 22 p. Universities Space Research Association-supported research. refs

A simple, rapid method for determination of protein solubilities has been developed which is based upon maximization of the free solution volume to be brought into equilibrium. The tetragonal lysozyme solubility diagram has been determined from pH 4.0 to 5.2 (0.1 M sodium acetate), 2-7 percent NaCl, 3-25 C, and portions of the orthorhombic solubility diagram using this technique. Both tetragonal and orthorhombic solubilities were found to increase smoothly with decreasing salt concentration and increasing temperature; no retrograde solubilities were observed. Using column volumes of 75, 300, and 900 microliters, identical tetragonal lysozyme solubility diagrams were obtained. Chymotrypsinogen solubilities have also been determined using this apparatus, being retrograde over the temperature range tested. It is noted that the primary limiting factor in reducing the crystalline volume is the minimum solution sample size needed to accurately quantitate the protein. L.K.S.

A91-33204* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

GLUTAMINE SYNTHETASE IMMUNOREACTIVE OLIGODENDROGLIA OF REGIONS OF THE CENTRAL NERVOUS SYSTEM

FERNANDO D'AMELIO (NASA, Ames Research Center, Moffett Field, CA), LAWRENCE F. ENG (Stanford University, CA), and MICHAEL A. GIBBS (USVA, Medical Center, Palo Alto, CA) GLIA (ISSN 0894-1491), vol. 3, 1990, p. 335-341. USVA-supported research. refs

(Contract NCC2-449; NIH-NS-11632)

Copyright

Glutamine synthetase immunoreactive oligodendrocytes were identified in the cerebral cortex, cerebellum, brain stem, and spinal cord. They were mostly confined to the gray matter, particularly close to neurons and processes. The white matter showed few immunoreactive oligodendroglia. It was suggested that some type of oligodendrocytes, specially those in perineuronal location, might fulfill a functional role more akin to astrocytes than to the normally myelinating oligodendroglia. Author

A91-33829

ALTERATIONS IN CELLS OF PERIPHERAL BLOOD IN GUINEA PIGS EXPOSED TO A CONSTANT MAGNETIC FIELD [IZMENENIYA KLETOK KROVI MORSKIKH SVINOK POSLE VOZDEISTVIA POSTOIANNOGO MAGNITNOGO POLIA]

M. A. BREGADZE (AN GSSR, Institut Fiziologii, Tbilisi, Georgian SSR) Akademiia Nauk Gruzinskoi SSR, Soobshchenia (ISSN 0132-1447), vol. 139, Sept. 1990, p. 605-608. In Russian. refs

Copyright

The effects of the exposure of adult guinea pigs to a steady magnetic field (SMF) on the content of hemoglobin in peripheral blood, the numbers of red and white blood cells, and blood-cell morphology were investigated in animals subjected for 10 days to single or multiple (for 3, 5, 10, or 25 min) daily exposures to a 300-Oe magnetic field. Results show that white blood cells had a higher sensitivity to SMF exposures than did erythrocytes; the degree of cell damage, the character of morphological changes, and the rate of restoration depended upon the duration of exposures. I.S.

A91-34338

MORPHOMETRIC EVALUATION OF THE MYOCARDIA OF RATS FLOWN ON THE BIOSATELLITE COSMOS 2044 FOR 14 DAYS [MORFOMETRYCZNA OCENA KOMOREK MIESNA SERCOWEGO U SZCZUROW KTÓRE ODBYŁY 14 DNIOWY LOT W SATELICIE BIOSPUTNIK 2044]

PIOTR SKOPINSKI, WANDA BARANSKA, MAGDALENA JAROSZ (Warszawa, Akademia Medyczna, Instytut Biostruktury, Warsaw, Poland), and ALEKSANDR KAPLANSKII (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) Postepy Astronautyki (ISSN 0373-5982), vol. 23, no. 1-2, 1991, p. 75-85.

In Polish. refs

Copyright

The myocardia of rats flown on Cosmco 2044 for 14 days was analyzed morphometrically at the subcellular level. Weightlessness was found to produce the following changes in heart-muscle cells: thinning and shortening of the sarcomeres, decrease in the number of mitochondria, and increased accumulation of glycogen. The observed changes are similar to those observed previously for myocardial apex myofibrils on Cosmos 1887. B.J.

A91-35418

THE PROTECTIVE EFFECT OF HYPERBARIC OXYGEN ON HEARING DURING CHRONIC NOISE EXPOSURE

ZHENG-YUAN HU, XIU-FENG SHI, ZHEN-FU LIANG, ZHI-WEN TANG, and XIAO-QING JIN (Naval Medical Research Institute, Shanghai, People's Republic of China) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, May 1991, p. 403-406. refs

Copyright

A series of experiments were conducted on guinea pigs to study the protective effect of hyperbaric oxygen (HBO) on hearing during chronic repeated noise exposure. A 1/3 octave band of noise centered at 1000 Hz was used (126 dB SPL, 1 h daily for 5 d; or 108 dB SPL, 1 h daily, 5 d/week for 4 weeks). Some groups of animals were treated with HBO (2-3 ATA, 1 h duration) before noise exposure. The results indicate that inhalation of HBO (every other day) can markedly reduce noise-induced threshold shift and relieve cochlear damage. The mechanism responsible for HBO protection against noise-induced hearing damage is discussed.

Author

A91-35670

THE ROLE OF THERMAL-SHOCK PROTEINS IN THE NATURAL ADAPTATION OF THE ORGANISM TO HEAT [O ROLI BELKOV TEPLOVOGO SHOKA V ESTESTVENNOI ADAPTATSII ORGANIZMA K TEPLU]

KH. A. UL'MASOV, V. K. DASHKEVICH, S. SHAMMAKOV, K. K. KARAEV, A. KH. BABAIEVA (AN TSSR, Institut Fiziologii i Eksperimental'noi Patologii Aridnoi Zony and Institut Zoologii, Ashkhabad, Turkmen SSR; AN SSSR, Institut Molekuliarnoi Biologii, Moscow, USSR) et al. Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 316, no. 3, 1991, p. 749-753. In Russian. refs

Copyright

Experiments were conducted on a wide range of lizard species representative of differential climatic and geographic zones of the USSR. It is demonstrated thermal-shock proteins play an important role in heat adaptation on the organismic level, at least for cold-blooded animals. L.M.

A91-35802

PRIMARY CONVERSION OF LIGHT ENERGY DURING PHOTOSYNTHESIS [PERVICHNOE PREEBRAZOVANIE SVETOVOI ENERGII PRI FOTOSINTEZE]

VLADIMIR A. SHUVALOV Moscow, Izdatel'stvo Nauka, 1990, 209 p. In Russian. refs

Copyright

Results are presented on measurements of the main steps in the primary conversion of light energy during photosynthesis in photosynthetic bacteria and green plants, using an ultrafast laser and other optical methods. Special attention is given to the structure of photosynthetic reaction centers (RCs) in photosynthetic bacteria, as revealed by X-ray analyses of RC crystals; the exciton interaction among pigment molecules in the RCs; and studies of the molecular nature of electron carriers in photosynthetic RCs using data on redox reactions in the RCs of bacteria and in the photosystems I and II of green plants. Consideration is also given to the principles of the spectroscopy of condensed-phase molecules; the femtosecond and picosecond electron transfer in photosynthetic RCs; and the determination of energy states with separated charges in bacterial photosynthetic RCs and in RCs of the photosystems I and II of green plants. I.S.

A91-35948* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

ANALYTICAL RELATIONSHIPS OF NUCLEAR FIELD AND MICRODOSIMETRIC QUANTITIES FOR TARGET FRAGMENTATION IN TISSUE SYSTEMS

JOHN W. WILSON (NASA, Langley Research Center, Hampton, VA), FRANCIS A. CUCINOTTA, and FERENC HAJNAL (DOE, Environmental Measurements Laboratory, New York) Health Physics (ISSN 0017-9078), vol. 60, April 1991, p. 559-565. refs Copyright

A simple analytic formula for the nuclear fields formed by target fragmentation in tissue systems is derived using the continuous slowing down approximation (CSDA). The energy fluctuations in sensitive localized sites within the tissue system caused by these nuclear events are defined by microdosimetry. In that CSDA is used, the energy fluctuations exclude the role of secondary electrons. The relations also relate to the response of microdosimetric devices to nuclear fragmentation fields. Author

N91-21696*# National Aeronautics and Space Administration, Washington, DC.

EXPLORING THE LIVING UNIVERSE: A STRATEGY FOR SPACE LIFE SCIENCES

Jun. 1988 21 p Original contains color illustrations (NASA-TM-103399; NAS 1.15:103399) Avail: NTIS HC/MF A03; 2 functional color pages CSCL 06C

The knowledge obtained by space life sciences will play a pivotal role as humankind reaches out to explore the solar system. Information is needed concerning the existence of life beyond the Earth, the potential interactions between planets and living organisms, and the possibilities for humans to inhabit space safely and productively. Programs in the involved disciplines are an integral part of NASA's current and future missions. To realize their objectives, the development and operation of diverse ground and flight facilities and close coordination with numerous scientific and governmental organizations in the U.S. and abroad are required. The status and goals of the life sciences programs are examined. Ways and means for attaining these goals are suggested. B.G.

N91-21697# National Academy of Sciences - National Research Council, Washington, DC. Committee on the Use of Animals in Research.

SCIENCE, MEDICINE AND ANIMALS

JOHN E. BURRIS and STEVE OLSON, ed. 1991 41 p (ISBN-0-309-04439-1; LC-90-27785) Avail: NTIS HC/MF A03

The history, status, and potential of animal research is described in the hopes of providing the information which will allow people to judge the merit and necessity for continuing animal research. The use of animals in research; advances as a result of animal experimentation; benefits to animals from animal research; alternatives; animal rights; laws and regulations; pain and suffering; use of pound animals; and the cost to society of the Animal Rights Movement are briefly covered. B.G.

N91-21698# Arizona State Univ., Tempe. Dept. of Chemistry. **A CENTER FOR THE STUDY OF EARLY EVENTS IN PHOTOSYNTHESIS**

1991 23 p (Contract DE-FG02-88ER-13969) (DE91-008509; DOE/ER-13969/T1) Avail: NTIS HC/MF A03

The first 2 1/2 years of the Center have been very productive. Research completed by Center scientists has resulted in publication or acceptance of 60 papers, with several more currently under consideration. Individual project summaries are as follows: J. P. Allen is investigation molecular mechanisms of the reaction center, and influence of protein structure on the electronic properties of the primary electron donor. R. E. Blankenship is investigating the structure and function of chlorosome antennas in green photosynthetic bacteria. D. Brume is investigating the organization of chlorosomes and characterizing the role of proteins in chlorosomes. W. D. Frasch is studying the structure and mechanism of the two manganese requiring photosynthetic enzymes, the

oxygen evolving complex and the energy transducing complex. D. Gust, T. A. Moore and A. L. Moore are investigating artificial photosynthesis systems where proteins have been replaced by covalent linkages between pigments molecules. S. H. Lin is developing a theory to explain photoinduced electron transfer and femto-second processes. G. R. Seely has developed a self-assembling model of primary charge separation in photosynthesis. W. F. J. Vermaas is optimizing site-directed mutagenesis studies of the acceptor side of photosystem 2. A. N. Webber is studying the biogenesis of photosystem 1 and 2 reaction center complexes in plants, green algae, and cyanobacteria. N. W. Woodbury is studying chimeric reaction centers and a reaction center symmetry mutant. DOE

N91-21699# European Space Agency, Paris (France). **IN VITRO PHOTOREACTIVATION OF TRANSFORMING DNA OF BACILLUS SUBTILIS SPORES AFTER IRRADIATION BY ULTRAVIOLET LIGHT**

CORINNA PANITZ (Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne, Germany, F.R.) Nov. 1990 95 p Transl. into ENGLISH of In Vitro-Photoreaktivierung von Transformierender DNA aus Bacillus Subtilis-Sporen Nach Bestrahlung mit Ultraviolett Licht (Cologne, Fed. Republic of Germany, DLR), 1989 99 p Original language document was announced as N90-24710

(ESA-TT-1210; DLR-FB-89-45; ETN-91-98971) Avail: NTIS HC/MF A05

Inactivation of bacteria by UV radiation is caused by photoproducts in the DNA that are insufficiently repaired or not at all. The biological relevance of cis-syn thymine dimer can be tested by photoreactivation. A transforming system of Bacillus subtilis was utilized with in vitro photoreactivation. The UV sensitivity of transformation depends on the state of the DNA: transformation is less UV sensitive, if the DNA is UV irradiated inside the bacterial spore compared to in vitro UV irradiation. In the latter case only, photoreactivation occurs. This system will be used to investigate the photochemical reason of the increased UV-sensitivity of Bacillus subtilis spores, if UV irradiated in vacuum. ESA

N91-21700* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

ROTATING BIO-REACTOR CELL CULTURE APPARATUS Patent

RAY P. SCHWARZ, inventor (to NASA) and DAVID A. WOLF, inventor (to NASA) 29 Jan. 1991 10 p Filed 30 Jun. 1988 Supersedes N89-14666 (27 - 6, p 803)

(NASA-CASE-MSC-21293-1; US-PATENT-4,988,623; US-PATENT-APPL-SN-213559; US-PATENT-CLASS-435-286; US-PATENT-CLASS-435-284; US-PATENT-CLASS-435-285; US-PATENT-CLASS-435-292; US-PATENT-CLASS-435-311; US-PATENT-CLASS-435-312; US-PATENT-CLASS-435-316)

Avail: US Patent and Trademark Office CSCL 06C

A bioreactor system is described in which a tubular housing contains an internal circularly disposed set of blade members and a central tubular filter all mounted for rotation about a common horizontal axis and each having independent rotational support and rotational drive mechanisms. The housing, blade members and filter preferably are driven at a constant slow speed for placing a fluid culture medium with discrete microbeads and cell cultures in a discrete spatial suspension in the housing. Replacement fluid medium is symmetrically input and fluid medium is symmetrically output from the housing where the input and the output are part of a loop providing a constant or intermittent flow of fluid medium in a closed loop. NASA

N91-21701* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

SPIRAL VANE BIOREACTOR Patent

DENNIS R. MORRISON, inventor (to NASA) 26 Mar. 1991 14 p Filed 29 Nov. 1988 Supersedes N89-25557 (27 - 19, p 2739) Sponsored by NASA. Johnson Space Center

(NASA-CASE-MSC-21361-1; US-PATENT-5,002,890; US-PATENT-APPL-SN-278137; US-PATENT-CLASS-435-286;

51 LIFE SCIENCES (GENERAL)

US-PATENT-CLASS-435-289; US-PATENT-CLASS-435-311;
US-PATENT-CLASS-435-315; US-PATENT-CLASS-435-316;
US-PATENT-CLASS-210-396; INT-PATENT-CLASS-C12M-03/06)
Avail: US Patent and Trademark Office CSCL 06C

A spiral vane bioreactor of a perfusion type is described in which a vertical chamber, intended for use in a microgravity condition, has a central rotating filter assembly and has flexible membranes disposed to rotate annularly about the filter assembly. The flexible members have end portions disposed angularly with respect to one another. A fluid replenishment medium is input from a closed loop liquid system to a completely liquid filled chamber containing microcarrier beads, cells and a fluid medium. Output of spent medium is to the closed loop. In the closed loop, the output and input parameters are sensed by sensors. A manifold permits recharging of the nutrients and pH adjustment. Oxygen is supplied and carbon dioxide and bubbles are removed and the system is monitored and controlled by a microprocessor. NASA

N91-21702# Chicago Univ., IL.
SPECIFICITY OF MUTATION INDUCED BY IONIZING RADIATION AND OXIDIZING FREE RADICALS

B. S. STRAUSS Oct. 1990 9 p
(Contract DE-FG02-88ER-60678)
(DE91-008838; DOE/ER-60678/3) Avail: NTIS HC/MF A02

The overall goal of this work is an understanding of the molecular mechanisms by which ionizing radiation damage is converted to mutation. We assume that induced mutation occurs as a result of DNA synthesis past damaged nucleotide bases (translesion synthesis). The mutational process can be dissected into three parts. If one considers a growing chain stopped just before a lesion, one can study an addition step in which a new base is added opposite the damaged site, an elongation step in which additional bases are added to permit synthesis past the lesion, and an excision step which competes with the elongation step and results in removal of the added base. Polymerases have an inherent specificity in the absence of template and tend, in the absence of an instructional site or lesion, to add adenine nucleotides. This overall viewpoint accounts for a great deal of the published data on mutational specificity. There are three main conclusions from our work of the grant period, relevant to this hypothesis. First, suppression of 3' (yields) 5' exonuclease activity provides additional time for the elongation reaction to occur. Second, ionizing radiation results in frame shift mutations at runs of pyrimidines as though non-instructive lesions were produced at these sites. Finally, ionizing radiation induced mutations produced as a result of base damage occur mainly at C's with a deficiency of base substitutions at the site of T's as would be expected if A's were inserted opposite damaged bases. DOE

N91-21703# Pennsylvania State Univ., University Park. Dept. of Agronomy.

COMPARISON OF THE ACTIVITY OF SUBSURFACE AND SURFACE MICROORGANISMS AND THEIR ANAEROBIC TRANSFORMATION OF HETEROCYCLIC COMPOUNDS

J.-M. BOLLAG Feb. 1991 14 p
(Contract DE-FG02-87ER-60556)
(DE91-008839; DOE/ER-60556/T2) Avail: NTIS HC/MF A03

The physiological characteristics were compared of microorganisms derived from subsurface and surface environments and their ability to transform heterocyclic aromatic chemicals. Essentially indole and pyridine compounds were selected as representatives of heterocyclic compounds. The samples investigated originated from the subsurface drillings at the Savannah River Plant, from surface samples in Pennsylvania, from municipal sewage of State College, Pennsylvania, and from pyridine-contaminated sites at Indianapolis. At different physiological conditions (aerobic, denitrifying, sulfate reducing or methanogenic), different groups of microorganisms are active. Not only the thermodynamics of microbial physiology vary, but different metabolic pathways are used by the various types of microbial processes. Therefore, it was important to determine under which physiological conditions a compound was metabolized, and to

clarify the metabolic conditions under which intermediate(s) were produced. DOE

N91-22173*# Fielder (Judith), Reston, VA.
A HYDROPONIC DESIGN FOR MICROGRAVITY AND GRAVITY INSTALLATIONS

JUDITH FIELDER and NICKOLAUS LEGGETT (Leggett, Nickolaus, Reston, VA) /n NASA. Lewis Research Center, Vision-21: Space Travel for the Next Millennium p 436-439 Apr. 1990
Avail: NTIS HC/MF A25 CSCL 06/3

A hydroponic system is presented that is designed for use in microgravity or gravity experiments. The system uses a sponge-like growing medium installed in tubular modules. The modules contain the plant roots and manage the flow of the nutrient solution. The physical design and materials considerations are discussed, as are modifications of the basic design for use in microgravity or gravity experiments. The major external environmental requirements are also presented. Author

N91-22175*# Wake Forest Univ., Winston-Salem, NC. School of Medicine.

CHARACTERIZATION OF BLOOD DRAWN RAPIDLY FOR USE IN BLOOD VOLUME EXPANSION STUDIES: AN ANIMAL MODEL FOR SIMULATED WEIGHTLESSNESS

V. MICHELLE CHENAULT, COLLEEN D. LYNCH, MARIANA MORRIS, JILL CLODFELTER, and PHILLIP M. HUTCHINS /n NASA. Lewis Research Center, Vision-21: Space Travel for the Next Millennium p 460-467 Apr. 1990
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It was demonstrated that up to 8ml of blood can be drawn from donor rats without significantly increasing volume and stress sensitive hormones, and thus can be used for volume expansion studies. Infusion of whole blood allows more physiological changes that can be seen with volume expansion by saline or other ionic solutions. The infusion of whole blood to induce hypervolemia may provide an improved model to study the fluid balance and control mechanisms operative in weightlessness. Blood samples were drawn as quickly as possible from femoral artery catheters chronically implanted in Sprague Dawley rats and analyzed for hematocrit, plasma sodium, potassium, osmolality, corticosterone, epinephrine, norepinephrine, and vasopressin. The levels were found to be comparable to those of normal rats. Author

N91-22681# Weizmann Inst. of Science, Rehovoth (Israel).
EIGHTH INTERNATIONAL SYMPOSIUM ON AFFINITY CHROMATOGRAPHY AND BIOLOGICAL RECOGNITION: PROGRAM AND ABSTRACTS Abstracts Only

3 Nov. 1989 126 p Symposium held in Jerusalem, Israel, 29 Oct. - 3 Nov. 1989; sponsored by Israel Academy of Sciences and Humanities, Maurice and Gabriela Goldschleger Conference Foundation at the Weizmann Inst. of Science, Israel Ministry of Science and Development, and International Society for Biorecognition Technology
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Papers presented at the Symposium covered new developments in affinity-based separation, DNA-protein interactions, general concepts and applications of receptors, applications of protein-ligand interactions, biosensors and immunoassay, immunoaffinity separations, selected applications, tailor-made enzymes and receptors, and novel matrices and affinity approaches.

N91-22682# Tel-Aviv Univ. (Israel). Dept. of Biotechnology.
ACHIEVEMENTS, DIFFICULTIES AND PREDICTED DEVELOPMENTS IN IMMUNOAFFINITY CHROMATOGRAPHY Abstract Only

EPHRAIM KATCHALSKI-KATZIR /n Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 2 p 3 Nov. 1989
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The recent wide use of immunoaffinity chromatography arises from the availability of an increasing variety of monoclonal antibodies (MAB), which can be covalently bound onto chosen

water-insoluble carriers. However, MAbs represent labile proteins, are relatively expensive and are produced by hybridoma cells which might lead to the appearance of trace amounts of biologically hazardous materials in conjunction with the immunoaffinity purified antigen. Elution of absorbed proteins from the MAb-carrier conjugates should be performed under the mildest possible conditions, to avoid irreversible denaturation of both the adsorbed protein and the bound antibody. A detailed x-ray three-dimensional analysis of the complexes between lysozyme and the Fab fragments of corresponding MAbs has led to the elucidation of the interaction between the enzyme-antigen and its corresponding MAbs on an atomic scale. Some techniques for the covalent binding of antibodies onto their corresponding carriers lead to partial inactivation of the MAbs used, or to antibody leakage from the carrier-MAb conjugate. A detailed investigation has been made of the covalent binding techniques used for antigen purification, with particular emphasis on the direct binding of MAbs to epoxy groups of a carrier, and to the directed binding of chemically or enzymatically oxidized MAbs onto hydrazide containing carriers. The possible immobilization of MAbs via anti-Fc immunoglobulins has also been considered. In some cases, a marked increase in immobilized MAb activity was recorded when the available amino groups of the antibody were reversibly blocked with dimethylmaleic anhydride before coupling with a chemically reactive carrier. MAbs were found to differ markedly in their response to the various reagents and procedures used. An assay has been developed to monitor the amount of non-specifically adsorbed proteins, and procedures have been developed to reduce non-specific adsorption, which could lead to severe contamination of the protein product. Polyethylene glycol, of average m.w. 400 or 1,500, was found particularly useful for this purpose. ISA

N91-22683# Tel-Aviv Univ. (Israel). Lab. of Neurobiochemistry. **AFFINITY CHROMATOGRAPHY PURIFICATION OF THE NMDA/PHENCYCLIDINE RECEPTOR COMPLEX Abstract Only** A. F. IKIN, Y. KLOOG, and MORDECHAI SOKOLOVSKY *In its* 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989
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The N-methyl-D-aspartate (NMDA) / phencyclidine (PCP) receptor from rat forebrain was solubilized with sodium cholate and purified to apparent homogeneity by a single step of affinity chromatography on amino-PCP-agarose. By means of this single purification step (with a relatively short purification time: 12-15 hrs) about 3700-fold purification was achieved. Polyacrylamide gel electrophoresis in the presence of sodium dodecyl sulfate and dithiothreitol revealed four major bands of Mr 67,000, 57,000, 46,000 and 33,000. (H3)-azido PCP was irreversibly incorporated into each of these bands after UV-irradiation. The dissociation constant ($K_{sub D}$) of (1-(1-thienyl)cyclohexyl) piperidine((H3)TCP) binding to the purified NMDA/PCP receptor was 120 nM. The maximum specific binding ($B_{sub max}$) for (H3)TCP binding was 3.3 nmol/mg protein. The binding and pharmacological features of the purified receptor are similar to those observed in membranes and in soluble extracts. Purification did not significantly alter the binding affinities of the noncompetitive channel blockers, and the stereoselectivity of their binding site was unimpaired. The binding of (H3)TCP to the purified complex exhibited a sensitivity to NMDA-receptor ligands similar to that seen in membranes. The marked effect of glycine on glutamate-induced or NMDA-induced (H3)TCP binding and the effect of PCP-receptor complex was functionally purified, since the interaction between the different ligand sites (glutamate, glycine) and the channel was maintained.

Author (ISA)

N91-22684# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Virology. **SOLUBLE CYTOKINE-RECEPTORS ARE PRESENT IN NORMAL HUMAN URINE Abstract Only** DANIELA NOVICK, HARTMUT ENGELMANN, DAVID WALLACH (InterPharm Labs., Nes-Ziona, Israel), and MENACHEM RUBINSTEIN *In its* 8th International Symposium on Affinity

Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989
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Analysis of urine from normal donors was performed in order to address the question whether release of soluble cytokine receptors into body fluids is a general phenomenon. Affinity chromatography of crude human urinary proteins on either immobilized human rIL-6, human rIFN-gamma or monoclonal anti IFN-gamma receptor antibody yielded the respective two soluble receptors in significant quantities. A single sequence of 30 a.a. residues was obtained by N-terminal microsequencing of the protein peak purified in two steps (affinity chromatography on IL-6 column and RP-HPLC). This sequence was identical to the predicted N-terminal sequence of IL-6 receptor as previously reported by Yamasaki et al. (1988). Analysis of the eluted proteins from both IFN-gamma and anti IFN-gamma receptor columns by inhibition of sRIA, ELISA, SDS-PAGE, and Western blotting proved the existence of soluble IFN-gamma receptor in normal urine. This finding together with the already known presence of urinary TNF binding proteins and a soluble IL-2 receptor both in plasma and in urine, indicates that release of soluble cytokine receptors into body fluids is a general phenomenon which occurs under normal physiological conditions. Author (ISA)

N91-22685# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Biophysics.

AVIDIN-BIOTIN TECHNOLOGY Abstract Only EDWARD A. BAYER and MEIR WILCHEK *In its* 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989
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The application of avidin-biotin technology, originally designed to facilitate and improve purification and localization procedures for biologically active macromolecules, has led to major advances in medical diagnostics. Among other new applications are affinity targeting, crosslinking and immobilization studies, cell cytometry, blotting technology, drug delivery, bioaffinity sensors, fusogenic sensors and hybridoma technology. Biotin, coupled to low- or high-molecular weight molecules, can still be recognized by avidin, so that mediation through the avidin-biotin complex often leads to a dramatic enhancement in signal and/or sensitivity levels. In recent years, there has been a tendency to replace egg-white avidin with the bacterial cognate, streptavidin, which is a nonglycosylated, neutral protein with a similarly high affinity constant for binding biotin, and which is free of the egg-white protein's oligosaccharide moiety and basicity. A number of new biotin-containing reagents and additional avidin- and streptavidin-conjugated probes have been designed. Modification of some of the disadvantageous properties of the egg-white glycoprotein is being attempted, since it is much less expensive than the bacterial protein. Determination of the structural and functional requirements for the high-affinity avidin-biotin interaction is being attempted, with the aim of improving its application and better understanding other lower-order affinity interactions. ISA

N91-22686# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Hormone Research.

NEW DEVELOPMENTS AND APPLICATIONS OF IMMUNOASSAY TECHNOLOGY Abstract Only FORTUNE KOHEN and G. BARNARD (City Univ., London, England) *In its* 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989 Sponsored by Georgetown Univ., Medical School, Washington, DC
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In addition to radio labelling, four types of labels are used in immunoassay technology: particles, enzymes, fluorophores and chemiluminophores. Of these labels, the lanthanide chelates, e.g., europium, can yield higher specific activities than commonly used radioisotopes, and have different fluorescence emission wavelengths, which can be discriminated by appropriate filters. In addition, the fluorescence half-lives of lanthanide chelates are up to six orders of magnitude longer than those of conventional

fluorophores; use of the principles of time-resolution enables the fluorescence of these chelates to be distinguished from the inherent fluorescence of biological materials, which has a very short half-life, on the order of nanoseconds. Consequently, the use of lanthanide chelates as labels in immunoassay procedures permitted the in-house development of sensitive, competitive type immunoassays for the direct measurement of haptens, two-site biotin-avidin interaction-based immunoassays for macromolecules and non-separation immunoassays for urinary steroid metabolites, for the delineation of the fertile period in women and for use in in-vitro fertilization programs. The principle of two-site immunoassays is being applied to mapping the antigenic epitopes of peptide hormones. The data obtained from two-site binding assays were used to generate computer-simulated three-dimensional representations of the antigenic sites in human growth hormone and variants that are recognized by the various monoclonal antibodies. This technique will be applied to proteins whose x ray structures are known, in order to compare electron density of proteins, as represented by x ray crystallography, with the computer-generated three-dimensional representation of the antigenic surface of macromolecules. ISA

N91-22687# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Biophysics.

HIGH PERFORMANCE THIOPHILIC ADSORPTION FOR ANTIBODY PURIFICATION Abstract Only

BERNHARD NOPPER, FORTUNE KOHEN, and MEIR WILCHEK *In its* 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989 Copyright Avail: NTIS HC/MF A07

Thiophilic adsorption chromatography, as developed by Porath and colleagues (1985), was modified and transformed to the high performance liquid chromatography (HPLC) mode on silica beads. The modification involves the introduction of an additional thioether group near the silica site of the ligand. This was accomplished by opening the epoxy ring on epoxy silica with sodium hydrosulfide. This reaction enabled the introduction of a thiol group on the silica. The thiol silica was used to react with divinyl sulfone and mercaptoethanol to yield the thiophilic adsorbent which was named 3S-silica. The 3S-adsorbent is of high capacity and is suitable for the fast and single-step purification of all subclasses of monoclonal and polyclonal antibodies. Other epoxy- or thiol-containing polymers were converted to 3S-adsorbents and were found to be very efficient in antibody purification. Due to their broad specificity, the 3S-thiophilic adsorbents are an inexpensive substitute for protein A and protein G columns for purification on antibodies.

Author (ISA)

N91-22688# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Neurobiology.

AFFINITY-REPUSSION CHROMATOGRAPHY Abstract Only

VIVIAN I. TEICHBERG *In its* 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989

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In protein purification by affinity chromatography, the desired protein binds to one of its specific ligands immobilized on an insoluble and neutral matrix while other proteins in the mixture do not. The retained protein can be removed from the matrix by addition of its free ligand, at concentrations allowing a displacement from the immobilized ligand, and recovered in solution as a complex with its free ligand, from which it can be dissociated by dialysis or molecular sieving. For proteins associating to the immobilized ligand with an association constant greater than $10(\exp -9)$ M, addition of the free ligand is insufficient, and more drastic elution conditions need to be applied. Affinity-repulsion chromatography was devised to circumvent these difficulties; it enables proteins to be eluted from affinity columns by addition of deionized water. The method is based on the fact that both the affinity chromatography matrix and the proteins which interact with it possess electrostatic charges which can attract or repel one another, according to their sign and respective distances. The effect of such electrostatic interactions is small in solutions containing high salt concentrations,

but can become considerable in deionized water. Thus, if a protein and the affinity matrix carry the same overall net electrostatic charge, the protein will be eluted by deionized water whenever the strength of the electrostatic repulsion between the protein and the matrix exceeds the attractive forces between the protein and the immobilized ligand. Such situations can be achieved by appropriate chemical modifications of the affinity matrix, so as to increase the charge density and adjust the distances. The application of this new chromatography principle to the isolation of lectins is discussed and it is shown that several members of this family of protein can be eluted from affinity columns with deionized water. The merits of affinity-repulsion chromatography are discussed and some of its potential applications are presented. ISA

N91-22689# Bar-Ilan Univ., Ramat-Gan (Israel). Dept. of Chemistry.

BIOMATERIAL INTERACTIONS WITH ORGANIZED SURFACES Abstract Only

SHMUEL MARGEL and D. Y. SOGAH *In* Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989

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Contact between polymeric surfaces and blood may induce thrombosis, complement activation or electrolyte depletion. The factors controlling this interaction are not well understood. An approach to elucidating the influence of various functional groups on the interaction of biomaterials with surfaces has been developed. It involves studying the interaction of defined peptides and cells with organized, close-packed monolayer surfaces composed of a variety of functional groups, e.g., -CH₂OH, -CO₂Me, -CH₃ and -CF₃, and the omega position. These surfaces were prepared through the self-adsorption of alpha, omega amphiphiles of the type SiCl₃(CH₂)_{1-x} (where x = CH₃, CH₂CO₂Me, CF₃, etc.) onto appropriate solid substrates. Characterization of these surfaces by techniques, such as ESCA, ellipsometry, FTIR-ATR and surface tension measurements, demonstrated that they are composed of fully extended molecules that cover most, if not all, of the solid substrates. The main conclusions are: that endothelial cells attach themselves and grow on the monolayer surfaces, according to the following decreasing order: -CH₂OH, -CO₂Me, -CH₃, -CF₃ and that the adsorption of proteins at the interface between the water solution and the monolayer surfaces depends on both the surface and the proteins. The degree of adsorption at the surfaces descends in the order: -CH₃, -CF₃, -CO₂Me, -CH₂OH. The degree of adsorption also increases with increasing protein hydrophobicity. ISA

N91-22690# Technion - Israel Inst. of Tech., Haifa. Dept. of Biomedical Engineering.

OXIDATIVE PROCEDURE FOR ACTIVATION OF HYDROXYL-CONTAINING POLYMERIC CARRIERS Abstract Only

ROSA AZHARI, A. SEIDEL, L. BAUCH, S. SIDEMAN, and NOAH LOTAN *In* Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989

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Immobilized bioactive materials have reached wide use in a variety of biotechnological processes. They are prepared using appropriate carriers (soluble or insoluble). The most frequently used of these carriers are the ones containing hydroxy groups. Many procedures have been suggested for activation of hydroxyl-containing carriers. The most efficient ones involve the use of cyanogen bromide, carbonyldiimidazole (CDI), sulfonyl chlorides, or fluoro methylpyridinium toluene sulfonate (FMP). These methods, however, have limitations concerning either the stability of the bond formed, the cost of the reagents, or the convenience of the procedure involved. In this report, a convenient and efficient method for activation of hydroxyl-containing polymeric carriers is presented. It involves the dimethyl sulfoxide-acetic anhydride oxidation (DAO) of the hydroxyl groups on the polymeric

carriers, converting them into aldehyde groups. Bioactive materials, carrying an amine moiety, can then be attached to the activated matrix, via an imine linkage. The suggested activation is carried out under mild conditions. The use of the DAO procedure to activate a soluble polysaccharide (inulin), an insoluble polysaccharide (Sephacrose) and a modified ceramic carrier (glycerol modified controlled pore glass) was investigated. It was found that the degree of oxidation is related to the duration of the reaction. Thus, when inulin was used as carrier, oxidation periods of five and 48 hours produced 0.3 and 1.6 mmole aldehyde/gr product, respectively. Efficiency of the DAO procedure was assessed using Sepharose as carrier. Thus, under chosen conditions, 3.8 mg tyramine were bound per gr produce. This value is similar to that obtained under optimal conditions using FMP activation (4 mg/gr product), and higher than when using CDI (1.8 mg/gr product). The above reagents show the same order of efficiency when immobilizing an enzyme, namely beta-glucosidase. Author (ISA)

N91-22691# Tel-Aviv Univ. (Israel). Dept. of Biotechnology.
**EUPERGIT C AS A CARRIER FOR HPLC-BASED
 IMMUNO-PURIFICATION OF ANTIGENS AND ANTIBODIES**
Abstract Only

GIDEON FLEMINGER, TAMAR WOLF, ERAN HADAS, and BEKA SOLOMON /In Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989
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In investigating the applicability of Eupergit C (EC)-immobilized antibodies and antigens to immunopurification, various enzymatically active proteins were used as antigens, and corresponding monoclonal antibodies mAbs were selected which did not inhibit the enzymatic activity of these antigens. Binding of the antigen by the matrix-immobilized antibody could thus be monitored by direct measurement of the enzymatic activity of the matrix-bound immunocomplex. This approach made possible the determination of the antigen binding activity of the conjugated antibodies at very high sensitivity. An immunopurification system, based on the EC-immobilized antibodies was found to be highly selective, reproducible and stable. EC beads of 30 u (C30N) were found to be most suitable for high performance liquid chromatography (HPLC) purification, demonstrating high antigen (or antibody) binding activity by the corresponding immobilized antibody (or antigen) and high peak performance. EC beads of 150 u, were found to be more suitable for conventional (non-HPLC) immuno-affinity purifications. EC beads of 1 u (C1Z) had lower capacity for protein binding to the matrix but antibodies bound to this matrix showed higher antigen binding activity than the 30 u and the 150 u beads, apparently owing the non-porous nature of this matrix. EC is characterized by high chemical and mechanical stability and stable protein-matrix linkage. Thus, an immunoaffinity purification cycle which included loading of an antigen-containing solution on a column at neutral pH and elution at higher pH may be repeated many times. This was shown with an immunopurification of a human decidua protein (HDP71) which was purified from seminal plasma by C30N-immobilized specific mAbs, using a HPLC system equipped with an autoinjector. Over 200 cycles of purification were applied without any loss in column capacity or performance. ISA

N91-22692# Tel-Aviv Univ. (Israel). Dept. of Biotechnology.
**REDUCTION OF NONSPECIFIC ADSORPTION OF SERUM
 PROTEINS TO EUPERGIT C AND AGAROSE** Abstract Only
 GIDEON FLEMINGER, TAMAR WOLF, BEKA SOLOMON, and ERAN HADAS /In Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989
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In an attempt to reduce non-specific adsorption of proteins to insoluble matrices during affinity chromatography, the effect of polyethylene glycol (PEG) on protein adsorption to Eupergit C (EC) and to agarose was studied. Oxirane-blocked EC was prepared by reaction of the matrix with 2-mercaptoethanol (2-ME). Serum samples (0.01-1.0 ml) were applied to columns packed with the

2-ME-blocked EC (2-M3-EC) or non-modified agarose. The amount of protein adsorbed onto the columns and eluted with SDS/urea solution or with 0.2 M ammonium acetate buffer, pH 10.00, was determined by monitoring the absorbance at 280 nm. In these studies, it was found that addition of PEG (400 or 1500) to the PBS buffer during the loading step of the serum reduced the amount of protein adsorbed to 2-ME-EC by about 90 percent. This effect was attributed to the increase in hydrophilicity of the matrix by the presence of PEG. A 'memory effect' was also observed: when PEG was removed from the matrix, its effect in reducing adsorption was still retained for 3-5 additional loading/elution cycles. In contrast to EC, when PEG was included in the loading buffer of serum onto the agarose column, protein adsorption increased by about 6-fold and no 'memory effect' was observed. Covalent binding of diamino PEG 1500 to EC and to epoxy-activated Sepharose resulted in modified matrices which showed a very low degree of protein adsorption even when PEG was eliminated from the loading buffer. Inclusion of PEG into the loading buffer during immunopurification process of a serum protein (IgG) or seminal plasma protein (human decidua protein HDP71) as well as the purification of these proteins on PEG-modified EC resulted in a marked improvement in the purity of these proteins eluted from the respective columns. ISA

N91-22693# Tel-Aviv Univ. (Israel). Dept. of Biotechnology.
**ENZYMATIC OXIDATION OF MONOCLONAL ANTIBODIES BY
 IMMOBILIZED BI-FUNCTIONAL ENZYME COMPLEXES**
Abstract Only

BEKA SOLOMON, RELA KOPPEL, FIDI SCHWARTZ, and GIDEON FLEMINGER /In Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989
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Site-specific modification of antibodies by oxidation with sodium periodate as a means for their oriented immobilization onto insoluble matrices is widely used. However, many antibodies are extremely sensitive to periodate oxidation and may lose their antigen-binding activity by this treatment. An alternative approach adopted by us was the enzymatic oxidation of the carbohydrate moieties of the antibodies. These residues, which are located remote from the antigen binding sites of the antibody, are composed of 0-1 residues of fucose, 3 of mannose, 1-2 of galactose, 3-4 of N-acetylglucosamine and 0-3 residues of sialic acid. The last is always a terminal sugar residue and may be removed by treatment with neuraminidase. Penultimate galactose residues may then be enzymatically oxidized by galactose oxidase to form corresponding aldehyde groups required for coupling to the carrier. Neuraminidase and galactose oxidase were oxidized by treatment with sodium periodate and co-immobilized onto adipic dihydrazine-modified Eupergit C (ADH-EC). The immobilized enzymes retained high activity and showed high stability under operational conditions. The enzymatic bifunctional complex obtained oxidized monoclonal antibodies very efficiently and selectively without impeding the immunological activity of the antibodies. The antigen-binding activities of monoclonal antibodies immobilized after enzymatic oxidation proved to be higher than those of the same antibodies immobilized after periodate oxidation, and was close to the theoretical value of 2 mole antigen per mole of bound antibody. Author (ISA)

N91-22694# Tel-Aviv Univ. (Israel). Dept. of Biotechnology.
**ADIPIC DIHYDRAZIDE-EUPERGIT C: A NEW DERIVATIVE FOR
 ORIENTED IMMOBILIZATION OF MONOCLONAL ANTIBODIES**
Abstract Only
 BEKA SOLOMON, ERAN HADAS, and GIDEON FLEMINGER /In Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989
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Eupergit C (EC) is a cross-linked synthetic copolymer based on methacrylamide, N-methylene bisacrylamide and monomers containing high numbers of oxirane groups which function as reactive moieties for the covalent binding of proteins via their

amino, thio and hydroxy groups. Some biologically active proteins (e.g., certain monoclonal antibodies) are partially or completely inactivated after immobilization onto the matrix as a result of improper orientation of the immobilized molecule or restriction induced by multi-point attachment of the protein molecule to the surface of the matrix. This was exemplified by the binding to EC of a series of anti-carboxypeptidase A (CPA) antibodies which are characterized after immobilization by low antigen binding activity. An alternative approach to the binding of the same mAbs to EC via the carbohydrate moieties was modification of oxirane groups to hydrazide or amino groups. Treatment of EC with hexamethylene diamine (HMD) or adipic acid dihydrazide (ADH) led to new derivatives suitable for an oriented immobilization of mAbs in particular and glycoproteins in general. Binding of mAbs to hydrazide modified carrier was carried out by a multi-step procedure including oxidation of the mAbs by sodium periodate, removal of excess of reagent and coupling of the protein to the modified carrier. Owing to the stable chemical composition of EC, a single step oxidation procedure was developed where oxidation of antibodies and binding to the matrix are performed concomitantly. Highly active antibody preparations were thus obtained which possessed about two fold higher antigen binding activity than the same antibodies immobilized on unmodified EC via their amino groups. ADH-EC proved to be an excellent carrier for one- or multi-step coupling of oxidized mAbs, owing to its high chemical stability and high binding capacity. Author (ISA)

N91-22695# Tel-Aviv Univ. (Israel). Dept. of Biotechnology.
ENHANCED ACTIVITY OF IMMOBILIZED DIMETHYMALEIC ANHYDRIDE-PROTECTED POLY- AND MONOCLONAL ANTIBODIES Abstract Only
 ERAN HADAS, RELA KOPPEL, FIDI SCHWARTZ, OSNAT RAVIV, and GIDEON FLEMMINGER *In* Weizmann Inst. of Science, 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989
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Immobilization of different antibodies onto solid supports usually results in partial or even complete loss of activity of the immobilized antibodies. Activity of some immobilized antibodies may be impaired even if the molecule is immobilized via sites which are close to its active site. Such interference is unlikely when the site of interaction of the protein with carrier is remote from the active site of the protein. Another possible mechanism for loss of activity of immobilized antibodies is impairment of intramolecular mobility which may follow multi-point attachment of the antibody to the carrier. Such effect would be dependent upon the number and distribution of reactive groups on the protein and on the carrier. Eupergit C is a polymethylmethacrylamide based carrier which is characterized by high content of reactive oxirane groups. The high density of reactive groups serves to increase the binding capacity of Eupergit C but also results in high multipoint attachment of antibodies. The application of reversible blocking of free amines with dimethylmaleic anhydride (DMA) in order to reduce multipoint attachment of antibodies to the carrier and thus improve the activity of the immobilized antibodies was investigated. The results obtained demonstrated a marked improvement in activity of immobilized poly- and monoclonal antibodies which were coupled to the matrix, following blocking of their free amines with DMA. Author (ISA)

N91-22696# BioTechnology General, Rehovot (Israel). Dept. of Biochemistry.
CHAPS BOOSTS THE RECOVERY OF HYDROPHOBIC MEMBRANE PROTEINS FROM VARIOUS CHROMATOGRAPHY MEDIA Abstract Only
 NACHUM REISS, IRIS YOSHPE, ALLON BOGIN, and MOSHE M. WERBER *In* its 8th International Symposium on Affinity Chromatography and Biological Recognition: Program and Abstracts 1 p 3 Nov. 1989
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Hydrophobic groups are usually involved in the structure of matrices for various chromatographic methods. These groups cause non-specific interactions with proteins, and especially hydrophobic proteins, reducing their recovery during purification. Another

detrimental effect is that the elution profile of the separated proteins may be shifted from that expected from their physico-chemical properties relevant to the chromatographic matrix in use. From the first chromatographic step, established by Muira et al. (1987), for the purification of membranal ADPase in the presence of Triton X-100, the recovery of ADPase activity was found to be very low, due to both irreversible binding to the DEAE-Sepharose matrix and sensitivity to the detergent. To overcome these problems, Triton X-100 was replaced with the zwitterionic detergent CHAPS, which was used at a concentration of 0.3 percent or more in all the purification steps: ion exchange chromatography (DEAE-Sepharose), hydrophobic chromatography (phenyl-Sepharose), metal chelate affinity chromatography (iminodiacetic acid-agarose) and molecular sieving (Superose 12). These concentrations of CHAPS boosted the recovery of ADPase activity from 20-30 percent at each step to 80-100 percent, and enabled the purification of significant amounts of the membranal protein. Author (ISA)

N91-22697*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
CENTRIFUGE FACILITY CONCEPTUAL SYSTEM STUDY. VOLUME 2: FACILITY SYSTEMS AND STUDY SUMMARY
 ROBERT SYNNESTVEDT, ed., PATRICIA BLAIR, ALAN CARTLEDGE, JORGE GARCES-PORCILE, VLADIMIR GARIN, MIKE GUERRERO, PETER HADELAND, MIKE HORKACHUCK, ULRICH KUEBLER, FRANK NGUYEN et al. Mar. 1991 458 p (NASA-TM-102860; NAS 1.15:102860) Avail: NTIS HC/MF A20 CSCL 06/3

The Centrifuge Facility is a major element of the biological research facility for the implementation of NASA's Life Science Research Program on Space Station Freedom using nonhuman species (small primates, rodents, plants, insects, cell tissues, etc.). The Centrifuge Facility consists of a variable gravity Centrifuge to provide artificial gravity up to 2 earth G's; a Holding System to maintain specimens at microgravity levels, a Glovebox, and a Service Unit for servicing specimen chambers. The following subject areas are covered: (1) Holding System; (2) Centrifuge System; (3) Glovebox System; (4) Service System; and (5) system study summary. Author

N91-22698# Marine Biological Lab., Woods Hole, MA.
METHODS IN COMPUTATIONAL NEUROSCIENCE Final Course Report, 5 Aug. - 1 Sep. 1990
 JAMES M. BOWER and CHRISTOF KOCH 1 Sep. 1990 11 p (Contract N00014-90-J-1965)
 (AD-A231397) Avail: NTIS HC/MF A03 CSCL 05/6

The 1990 version of the course enrolled a total of 22 students including three tenured faculty members for the first time. Digital Equipment Corporation provided the course with 25 DECstation 5000/200s which provided more than ample computer capability. Each student was assigned to their own workstation which assured access to computing resources at all times. The range of course projects undertaken in the computer lab this year was also excellent (see Appendix A). In general it was found that students were able to advance their models considerably further than in previous years. This particularly reflects two years of experience teaching students how to use the GENESIS simulator, and also reflects the fact that a growing number of students have already had some experience with neural simulations (and even GENESIS) before entering the course. GRA

N91-22699# Technische Univ., Eindhoven (Netherlands).
NAD(+)-NADH MODELLING STUDIES: AN ENZYMATIC AND CHEMICAL APPROACH Ph.D. Thesis
 NICOLINE ANNETTE BEIJER 1990 99 p (ETN-91-99175) Avail: NTIS HC/MF A05

Chemical and enzymatic studies on the coenzyme NAD⁺ and its reduced form NADH are reported. In combination with specific enzymes (dehydrogenases) the coenzyme is involved in the reversible stereospecific dehydrogenation of many substrates. Major focus is on the modeling of the coenzyme, but the relation between enzyme and coenzyme is also elucidated by modifying

the enzyme structure in its active site. Using molecular mechanics a number of mutated HLADH's are stimulated in order to select those amino acid residues which substantially affect the coenzyme geometry. The methodology developed may be helpful in selecting targets for site directed mutagenesis in order to genetically engineer HLADH so as to optimize the interaction of the apo-enzyme and coenzyme. ESA

N91-22700# Stockholm Univ. (Sweden). Inst. of Physics.
**METALS IN BIOLOGY: TECHNICAL DETAILS OF QUANTUM
CHEMICAL AB INITIO CALCULATIONS ON FERROUS AND
FERRIC IRON-BIS-GLYOXAL AND IRON-BIS-DITHIOLENE**
I. FISCHER-HJALMARS and H. HOLMGREN 22 Mar. 1989
42 p
(USIP-89-01; ETN-91-99242) Avail: NTIS HC/MF A03

Quantum chemical laboratory investigations aiming at a study of the binding between metal and ligand in biosystems, and electronic aspects governing biochemical reactions, including charge transfer, are addressed. The influence of an aqueous or other surrounding medium must be considered for small model complexes in vacuum. The first step of a stepwise approach, first to study the central complex as such, and at a later stage to introduce some kind of discrete model of the surrounding, is discussed. Results obtained for iron complexes with either oxygen or sulfur as ligand forming atoms are presented. ESA

N91-22701# Helsinki Univ. (Finland). Div. of Physiology.
**ROLE OF BICARBONATE IN THE ACTIONS OF
GAMMA-AMINOBUTYRIC ACID (GABA) ON MEMBRANE
CONDUCTANCES, CURRENTS, AND PH REGULATION IN
EXCITABLE CELLS Ph.D. Thesis - Helsinki Univ. of
Technology**
JUHA VOIPIO Helsinki, Finland Finnish Academy of Technical
Sciences 1990 69 p Sponsored by Finnish Academy of
Technical Sciences, Helsinki and Jenny and Antti Wihuri
Foundation
(ACTA-POLYTEC-SCAND-PH-172; ISBN-951-666-321-4;
ISSN-0355-2721; ETN-91-99259) Avail: NTIS HC/MF A04

Ion selective microelectrodes and a two or three microelectrode voltage or current clamp were used to examine the effects of inhibitory neurotransmitter Gamma Amino Butyric Acid (GABA) on intracellular pH (pH(i)) extracellular surface pH (pH(s)) intercellular chloride activity (a(i)Cl) as well as on membrane potential, current and conductance in crayfish muscle fibers and the Stretch Receptor Neurone (SRN). In the muscle, a near saturating concentration of GABA induced the following channel mediated, HCO_3^- (a(i)Cl) dependent effects: a depolarizing inward current, a rise in (a(i)Cl) and (pH(s)) and a fall in (pH(i)). Substitution of 30 mmol/l of Cl^- by HCO_3^- (a(i)Cl) brought about a (pH(i)) dependent positive deviation of the reversal potential of the GABA induced current (E(GABA)) from the equilibrium potential of Cl^- (E(Cl)). Experiments on the SRN gave very similar results. Measurements of (E(GABA)) yielded a value of about 0.3 for the relative permeability of HCO_3^- (a(i)Cl) versus Cl^- in the GABA channel. Experiments with carboxymate anions indicated that the effective diameter of the GABA gated channel in the muscle fiber is about 0.5 nm which is close to the value measured in mammalian GABA(A) channels. The present results show that the widely accepted equivalence of E(CL) and (E(GABA)) is not valid under physiological conditions, and that there is a bidirectional link between actions of GABA and regulation of pH. Application of linear cable theory as well as thermal design of electrometer amplifiers are also discussed. ESA

N91-22702# Los Alamos National Lab., NM.
**GRUNEISEN-STRESS INDUCED ABLATION OF BIOLOGICAL
TISSUE**
R. S. DINGUS and R. J. SCAMMON 1991 11 p Presented
at the 4th Society of Photo-Optical Instrumentation Engineers
(SPIE) International Symposium, Los Angeles, 20-25 Jan. 1991
(Contract W-7405-ENG-36)
(DE91-009957; LA-UR-91-905; CONF-910123-19) Avail: NTIS
HC/MF A03

The objective of biomedical applications of lasers is frequently to remove tissue in a controlled manner. However, for ablation induced by thermal- or photo-decomposition, damage to surrounding tissue may be excessive in some instances. Tissue can also be ablated by a hydrodynamic process referred to as front surface spallation, in which a thin layer next to a free surface is heated to levels, below vaporization but, so rapidly that it cannot undergo thermal expansion during laser heating. This generates a stress pulse, which propagates away from the heated region, with an initial amplitude that can be calculated using the Grueneisen coefficient. As the pulse reflects from the free surface, a tensile tail can develop of sufficient amplitude, exceeding the material strength, that a layer will be spalled off, taking much of the laser-deposited energy with it. Because tissue is generally a low strength material, this process has the potential of producing controlled ablation with reduced damage to the remaining tissue. However, to achieve these conditions, the laser pulse length, absorption depth and fluence must be properly tailored. This paper presents hydrodynamic calculations and analytical modeling relating to both stress- and thermal-induced ablation as a function of laser and tissue properties to illustrate the potential benefits of stress induced ablation. Also, guidance is given for tailoring the exposure parameters to enhance front surface spallation. DOE

N91-23028*# National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, MD.
BIOMEDICAL APPLICATIONS OF NASA TECHNOLOGY
DONALD S. FRIEDMAN In National Aeronautics and Space
Administration, Technology 2000, Volume 1 p 63-65 Mar. 1991
Avail: NTIS HC/MF A18 CSCL 06/3

Through the active transfer of technology, NASA Technology Utilization (TU) Program assists private companies, associations, and government agencies to make effective use of NASA's technological resources to improve U.S. economic competitiveness and to provide societal benefit. Aerospace technology from such areas as digital image processing, space medicine and biology, microelectronics, optics, and electro-optics, and ultrasonic imaging have found many secondary applications in medicine. Examples of technology spinoffs are briefly discussed to illustrate the benefits realized through adaptation of aerospace technology to solve health care problems. Successful implementation of new technologies increasingly requires the collaboration of industry, universities, and government and the TU Program serves as the liaison to establish such collaborations with NASA. NASA technology is an important resource to support the development of new medical products and techniques that will further advance the quality of health care available in the U.S. and worldwide. Author

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

A91-33158
**MEDICAL SUPPORT OF FLIGHTS ON
HIGH-MANEUVRABILITY AIRCRAFT [OPYT
MEDITSINSKOGO OBESPECHENIIA POLETOV NA
VYSOKOMANEVRENNYKH SAMOLETAKH]**
K. V. PONOMARENKO Voenno-Meditsinskii Zhurnal (ISSN
0026-9050), Jan. 1991, p. 53, 54. In Russian.
Copyright

This paper considers the type of clinical and laboratory tests specifically required for determining the physiological functions of flight personnel operating high-maneuverability aircraft and the pilot's ability to fly such aircraft. Results of analyses on 20 pilots, carried out immediately after such flights, showed unfavorable changes in the cardiovascular and respiratory systems of pilots. It was found that, as a result of flying high-maneuverability aircraft,

the self-assessment factor decreased, the heart rate increased, the delay time of exhalation decreased, and the orthostatic index heart activity indices increased. In addition, the values of systolic and diastolic arterial pressure increased, the delay time of inhalation decreased, and the respiratory capacity decreased. Only some of these parameters were found to recover completely by the day following the flight. I.S.

A91-33164

USE OF PLANT PREPARATIONS VALDAI AND AL'TAIR FOR INCREASING THE FUNCTIONAL CAPABILITY OF AN ATHLETE [ISPOL'ZOVANIE PREPARATOV RASTITEL'NOGO PROISKHOZHDENIIA 'VALDAI' I 'AL'TAIR' DLIA POVYSHENIIA FUNKTSIONAL'NYKH VOZMOZHNOSTEI SPORTSMENAI]

A. S. SOLODKOV, S. S. MIKHAILOV, D. N. DAVIDENKO, T. A. ZINCHENKO, and E. A. FAKTOR (Gosudarstvennyi Institut Fizicheskoi Kul'tury, Leningrad, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 17, Jan.-Feb. 1991, p. 120-125. In Russian. refs

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The effect of plant preparations Valdai and Al'tair on the physiological state, the metabolism, and the work capacity of an athlete was investigated by measuring various physiological, biochemical, and work-capacity indexes before the treatment and 5 and 10 days after the beginning of 10-long treatments either with two daily 20-g doses of Valdai or with single 30-g daily doses of Al'tair. Results of tests showed that both treatments increased work capacity of the subjects. This was due to a more economical use of functional reserves as well as to an increased mobilization of these reserves. It is suggested that both Valdai and Al'tair act as adaptogens, preparing the organism to a rapid mobilization of functional reserves. I.S.

A91-33166

CHANGES IN SEVERAL HORMONAL AND IMMUNE PARAMETERS IN HUMANS UNDER LOW-TEMPERATURE CONDITIONS [IZMENENIYA NEKOTORYKH GORMONAL'NYKH I IMMUNNYKH POKAZATELEI CHELOVEKA V USLOVIYAKH NIZKIKH TEMPERATUR]

T. V. PETROVA, I. P. BOBROVNITSKII, and I. A. GOL'TSEV Fiziologiya Cheloveka (ISSN 0131-1646), vol. 17, Jan.-Feb. 1991, p. 158-163. In Russian. refs

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Changes induced in the hormonal and the immune systems by physical exercises combined with low temperature conditions were investigated in two groups of subjects by analyses of blood and/or urine concentrations of insulin, cortisol, cAPM, cGMP, 2-beta-microglobulin. The subjects of the first group were participants in a 26-day-long ski trip during which temperature was between -25 and -40 C, and the daily caloric supply was 3500 kcal. Subjects of the second group were maintained for 20 days in shelters at temperatures between 0 and 7 C, except the 18th day, when the subjects executed a fast 6-km march in a winter forest; the daily caloric supply of this group was 1600 kcal. Results of periodic biochemical analyses showed that, regardless of the levels of physical activity and caloric supply, the blood concentration of insulin subjects decreased after the exposure to cold. However, results of cortisol, cortisol/insulin ratio, and immunoglobulin analyses indicated that adaptation mechanisms were activated both by the cold factor and by physical loads. I.S.

A91-33167

BLOOD CIRCULATION IN THE LIVER AND THE KIDNEYS DURING LOCAL DECOMPRESSION OF THE ABDOMINAL CAVITY [KROVOOBRASHCHENIE PECHENI I POCHK VO VREMIA LOKAL'NOI DEKOMPRESSII BRIUSHNOI OBLASTI]

V. E. KATKOV, V. V. CHESTUKHIN, A. E. ERMOLENKO, V. V. RUMIANTSEV, A. V. MASLENNIKOV et al. Fiziologiya Cheloveka (ISSN 0131-1646), vol. 17, Jan.-Feb. 1991, p. 180-183. In Russian. refs

Copyright

The effect of the local negative pressure (LNP) on blood flow in the liver and the kidneys of human subjects was investigated using thermodilution or radioisotope-dilution methods. It was found that an application of LNP caused a pressure fall in both the liver and the kidney veins; at the same time, the blood flow tended to decrease in the liver vein and to increase in the kidney veins. The acid-alkali indicators in the blood flowing from these veins remained relatively unchanged. It is suggested that a decrease in the local blood flow observed in the liver vein may be caused by blood accumulation due to LNP in the vessels of the skin and of subcutaneous tissues. I.S.

A91-33168

PSYCHOPHYSIOLOGICAL CHARACTERISTICS OF SUBJECTS WITH DIFFERENT RESISTANCES TO OVERHEATING IN THE INITIAL PERIOD OF ADAPTATION TO A HOT CLIMATE [PSIKHOFIZIOLOGICHESKIE OSOBENNOСТИ LITS S RAZLICHNOI USTOICHIVOST'YU K PEREGREVANIIU V NACHAL'NYI PERIOD ADAPTATSII K USLOVIYAM ZHARKOGO KLIMATA]

V. P. KOVALENKO, V. P. NATALENKO, and S. T. POSOKHOVA (Voenno-Meditsinskaya Akademiya, Leningrad, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 17, Jan.-Feb. 1991, p. 183-186. In Russian. refs

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A91-33275

NON-INVASIVE BLOOD PRESSURE MEASUREMENT UNDER G I. MCKENZIE (RAF, Institute of Aviation Medicine, Farnborough, England) SAFE Journal, vol. 21, Spring 1991, p. 26-30. refs

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A new commercially available device (Finapres) which allows the continuous monitoring of blood pressure has been evaluated against measurements taken intraarterially. It was found that Finapres tends to underestimate both systolic and diastolic blood pressures, and differs significantly from, but correlates well with, intraarterial line measurements. In general, the slope of the relationship between Finapres and intraarterial values is close to unity. It is important that the arm is supported in a way that prevents any local tissue compression in the forearm. Finapres follows the changes in blood pressure induced by exposure to +Gz well, but may not give reliable absolute values. This device is able to give useful information on blood pressure in subjects exposed to +Gz on the man-carrying centrifuge, with a minimum of discomfort. Author

A91-33316

GRAVITATIONAL FORCES ON THE CHEST WALL

SHAOBO LIU, THEODORE A. WILSON, and KRISTIAN SCHREINER (Minnesota, University, Minneapolis; Norges Idrettshogskole, Oslo, Norway) Journal of Applied Physiology (ISSN 0161-7567), vol. 70, April 1991, p. 1506-1510. refs (Contract NIH-HL-21584)

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The gravitational work of breathing has been determined by measuring the vertical motion of the body mass. Rib cage volume (Vrc) and abdominal volume (Vab) were varied while the subject performed breathing maneuvers sitting or lying supine on a force platform. It is found that, in the seated posture, the force on the rib cage is expiratory and the force on the abdomen is inspiratory; the magnitudes of both are about 8 cm H₂O. In the supine posture, both forces are expiratory and their magnitudes are about 9 cm H₂O. The gravitational work per unit volume of the chest wall expansion increases with increasing volume in both postures, and the coefficients of quadratic terms in the gravitational potential are all positive. These can be interpreted as gravitational contributions to the elastances of the compartments. O.G.

A91-33317

METABOLIC AND WORK EFFICIENCIES DURING EXERCISE IN ANDEAN NATIVES

P. W. HOCHACHKA, C. STANLEY, G. O. MATHESON, D. C. MCKENZIE, P. S. ALLEN (British Columbia, University, Vancouver;

Simon Fraser University, Burnaby; Alberta, University, Edmonton, Canada) et al. *Journal of Applied Physiology* (ISSN 0161-7567), vol. 70, April 1991, p. 1720-1730. Research supported by NSERC, Medical Research Council of Canada, and Alberta Heritage Foundation for Medical Research. refs
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During exercise to fatigue in 4200 m environment, Quechua natives accumulate plasma lactate to concentrations that are only one-third to one-half the values observed in lowlanders. The phenomenon of low lactate accumulation despite hypobaric hypoxia is known as the lactate paradox. It is suggested that the lactate paradox is either a developmentally or a genetically fixed metabolic characteristic of Quechua people that maximizes the amount of ATP obtained per mole of carbon substrate catabolized. The plasma metabolic data indicate that a substantial improvement in energetic efficiency of muscle work at submaximal rates minimizes the need for anaerobic sources of ATP. As plots of power output vs metabolic power input did not extrapolate to the origin, it is concluded that exercise in both groups sustains a significant ATP expenditure not convertible to mechanical work, but that this expenditure is downregulated in Andean natives by unexplained mechanisms.

O.G.

A91-33318**EXERCISE ENDURANCE AND ARTERIAL DESATURATION IN NORMOBARIC HYPOXIA WITH INCREASED CHEMOSENSITIVITY**

GORDON G. GIESBRECHT, A. PUDDY, M. AHMED, M. YOUNES, and N. R. ANTHONISEN (Manitoba, University, Winnipeg, Canada) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 70, April 1991, p. 1770-1774. Medical Research Council of Canada-supported research. refs
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The possibility of enhancing exercise endurance under normobaric hypoxia by increasing hypoxic ventilatory sensitivity with almitrine bismesylate (ALM) has been investigated. Resting subjects breathed an inspired O₂ fraction of 10.4-13.2 percent, which lowered arterial O₂ saturation (SaO₂) to 80 percent. It was found that saturation did not differ from placebo (PL) during air breathing but significantly exceeded SaO₂ with PL, by 3.4 percent during resting hypoxia, by 4 percent at the start of exercise, and by 5.9 percent at exhaustion. During air breathing, ventilation was not affected by ALM and during hypoxic rest and exercise; rather it was slightly increased. Endurance time with ALM was 20.6 + or - 1.6 min and with PL it was 21.3 + or - 0.9 min.

O.G.

A91-33319**EFFECTS OF LOWER LIMB UNLOADING ON SKELETAL MUSCLE MASS AND FUNCTION IN HUMANS**

H. E. BERG, G. A. DUDLEY, T. HAGGMARK, H. OHLSEN, and P. A. TESCH (Karolinska Institutet and Karolinska Hospital, Stockholm, Sweden; Bionetics Corp., Cocoa Beach, FL) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 70, April 1991, p. 1882-1885. Swedish Board for Space Activities-supported research. refs
Copyright

A model developed to simulate effects of microgravity on skeletal muscle mass and function is described. Six healthy men were subjected to unilateral lower limb unloading, allowing ankle, knee, and hip joint mobility. They performed concentric or eccentric quadriceps actions at different angular velocities. In response to unloading, concentric and eccentric peak torque (PT) and angle-specific torque (AST) across speeds decreased (P less than 0.05) by 22 and 16 percent, respectively. Muscle cross-sectional area (CSA) and radiological density (RD) decreased (P less than 0.05) by 7 and 6 percent, respectively. PT, AST, CSA, and RD returned to normal after 7 weeks of recovery. No changes were seen in the control limb except for a 6 percent decrease (P less than 0.05) in RD. Since reductions in muscle mass and strength were of similar magnitude to those produced by bed rest, it is suggested that this model could serve to simulate the effects of microgravity on skeletal muscle mass and function.

O.G.

A91-33774**RELATIONSHIP OF NUTRITION TO DISEASE AND PERFORMANCE. II**

R. GEORGE TROXLER (Southwest Research Institute, San Antonio, TX) *Aeromedical and Training Digest*, vol. 5, April 1991.

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The performance of individuals suffering from various nutrition-related conditions (such as obesity, dehydration, syndromes due to excessive caffeine consumption as well as to the withdrawal from caffeine, and alcoholism) is discussed, together with specific physiological disorders and/or diseases associated with these conditions. Suggestions of corrective measures for each of these nutritional disorders are proposed. Special attention is given to the composition of in-flight meals tailored to correct specific nutrition-related conditions.

I.S.

A91-33828**PHYSIOLOGICAL CHARACTERISTICS OF COUPLING BETWEEN CARDIAC EXCITATIONS AND CONTRACTIONS IN YOUNG ATHLETES DURING ADAPTATION SHIFTS CAUSED BY PHYSICAL LOADS [FIZIOLOGICHESKIE OSOBENNOSTI SOPRIAZHENIIA VOZBUZHDENIIA I SOKRASHCHENIIA SERDTSА U IUNYKH SPORTSMENOV PRI ADAPTATSIONNYKH SDVIGAKH POD VLIANIEM FIZICHESKOI NAGRUZKI]**

V. S. SHAGINIAN, F. O. SHRAIBMAN, and G. A. BOCHORISHVILI (Detskii Vrachebno-Fizkul'turnyi Dispanser, Tbilisi, Georgian SSR) *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia* (ISSN 0132-1447), vol. 139, Sept. 1990, p. 561-564. In Russian. refs
Copyright

A91-34339**EFFECT OF DISTURBED LUNG VENTILATION ON PILOT OR ASTRONAUT PERFORMANCE [WPLYW ZABURZONEJ WENTYLACJI PLUC NA SPRAWNOSC PILOTA I ASTRONAUTY]**

EUGENIUSZ SOKOLOWSKI (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) *Postepy Astronautyki* (ISSN 0373-5982), vol. 23, no. 1-2, 1991, p. 87-92. In Polish. refs
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Causes of respiratory hypocapnia and its effects on pilot and astronaut condition in flight or in a low-pressure chamber are considered. Features of the observed hyperventilation syndrome are examined, and ways to ameliorate this condition by means of appropriate oxygen equipment and breathing via oxygen mask are discussed.

B.J.

A91-34340**THE EFFECT OF REDUCED OXYGEN PARTIAL PRESSURE ON CERTAIN FUNCTIONS OF THE RESPIRATORY SYSTEM [WPLYW OBNIZONEGO CISNIENIA PARCJALNEGO TLENU NA ZACHOWANIE SIE WYBRANYCH FUNKCJI UKLADU ODDECHOWEGO]**

WOJCIECH DEBINSKI (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) *Postepy Astronautyki* (ISSN 0373-5982), vol. 23, no. 1-2, 1991, p. 93-95, 97-101. In Polish. refs
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The main reactions of the respiratory systems under reduced oxygen partial pressure are examined on the basis of a review of the literature and original experimental research. The role of chemoreceptors in the adaptation of the respiratory system to elevated hypoxia conditions is discussed, and processes that reduce oscillations of oxygen partial pressure in arterial blood and tissues are characterized. Finally, the effect of hypoxia on the synthesis and secretion of lung surfactant is considered.

B.J.

A91-34342**PHYSICAL CONDITIONING WITH THE AIM OF IMPROVING THE ACCELERATION TOLERANCE OF PILOTS [PRZYGOTOWANIE KONDYCYNNE PILOTOW ZWIEKSZAJACE TOLERANCJE PRZYSPIESZEN]**

JAN MARKS (Wojskowy Instytut Medycyny Lotniczej, Warsaw,

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Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 23, no. 1-2, 1991, p. 119-130. In Polish. refs

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A number of pilots underwent a three-week physical training course in a conditioning center. The results show a significant increase in acceleration tolerance and an improvement in general physical condition. B.J.

A91-34343

EFFECTS OF OXAZEPAM AND ALTITUDE HYPOXIA ON CHANGE IN CORTICOSTERONE LEVEL IN THE CIRCADIAN CYCLE [WPLYW OKSAZEPANU I NIEDOTLENIEŃ WYŚOKOŚCIOWEGO NA ZMIANY POZIOMU KORTYKOSTERONU W RYTMIE DOBOWYM]

ZBIGNIEW KOTER, WLADYSLAW SWIECICKI, and IZABELA MAKSYMOWICZ (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 23, no. 1-2, 1991, p. 131-140. In Polish. refs

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The effects of oxazepam in doses of 10 mg/kg and altitude hypoxia on changes in corticosterone level in the circadian cycle were investigated in experimental animals. Independently of time, altitude hypoxia was found to produce a large increase in average 24-hour levels of corticosterone in blood serum and the adrenal glands. The combined effect of oxazepam administration and the altitude hypoxia led to an increase in the average 24-hour level of corticosterone, particularly in the adrenal glands. B.J.

A91-34344

EFFECTS OF PROPRANOLOL AND ALTITUDE HYPOXIA ON THE CHANGE IN CATECHOLAMINE LEVEL IN THE CIRCADIAN CYCLE [WPLYW PROPRANOLOLU I NIEDOTLENIEŃ WYŚOKOŚCIOWEGO NA ZMIANY POZIOMU KATECHOLAMIN W RYTMIE DOBOWYM]

WLADYSLAW SWIECICKI, ZBIGNIEW KOTER, and STANISLAW ROSOL (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 23, no. 1-2, 1991, p. 141-150. In Polish. refs

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The effects of propranolol in doses of 10 mg/kg and altitude hypoxia on changes in the catecholamine level in the circadian cycle were investigated in rats. Altitude hypoxia was found to produce a reduction in the 24-hour levels of adrenaline and noradrenaline in the rat brains. The combined effect of altitude hypoxia and propranolol consisted in the atrophy of the 24-hour cycle of adrenaline and noradrenaline in the rat brains. B.J.

A91-34396

BIOMECHANICAL INTERPRETATION OF IN-FLIGHT LOSS OF CONSCIOUSNESS IN FIGHTER PILOTS SUBJECTED TO RAPID-ONSET-RATE +GZ ACCELERATION (STRONG JOLT) [INTERPRETATION BIOMECHANIQUE DES PERTES DE CONNAISSANCE EN VOL DES PILOTES DE CHASSE SOUS L'EFFET DE L'APPLICATION D'UNE ACCELERATION +GZ D'INSTALLATION RAPIDE /FORT JOLT/]

PIERRE QUANDIEU (DRET, Centre de Recherches de Medecine Aerospatiale, Bretigny-sur-Orge, France), DANIEL GAFFIE (ONERA, Chatillon, France), and PHILIPPE LIEBAERT (DRET, Paris, France) Academie des Sciences, Comptes Rendus, Serie II - Mecanique, Physique, Chimie, Sciences de la Terre et de l'Univers (ISSN 0764-4450), vol. 312, no. 3, Jan. 31, 1991, p. 185-190. In French. DRET-supported research.

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Results are reported from a mathematical modeling study of +Gz-induced loss of consciousness (GLOC) in fighter pilots. Stresses on the brain (considered as a viscoelastic mass), pressure in the cerebrospinal fluid, and blood flow in the brain veins and arteries are modeled separately. The derivation of the model equations is outlined, and preliminary results are presented in graphs. The findings support the hypothesis that loss of consciousness is due to sudden cranial hypertension. T.K.

A91-35415

HEAT BALANCE OF SUBJECTS WEARING PROTECTIVE CLOTHING WITH A LIQUID- OR AIR-COOLED VEST

ANDRE L. VALLERAND, ROBERT D. MICHAS, JOHN FRIM, and KENNETH N. ACKLES (Defence and Civil Institute of Environmental Medicine, North York, Canada) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, May 1991, p. 383-391. refs

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Experiments were conducted to determine the extent of heat strain induced by wearing the Canadian Forces aircrew chemical-defense individual protection ensemble (IPE) under simulated hot cockpit conditions and to evaluate the effectiveness of wearing a liquid-cooled (LC) or an air-cooled (AC) vest in combination with the IPE. Subjects were exposed to 37°C temperature and 50 percent relative humidity for a maximum of 150 min, either with no cooling (NC) or with LC or AC vests. It was found that NC subjects could tolerate only 95 min without cooling, and were experiencing significant heat strain. Wearing either LC or AC type of cooling vest was found to significantly alleviate heat strain, although greater relief was obtained with AC vests. I.S.

A91-35416* Universities Space Research Association, Houston, TX.

CONTROL OF NAUSEA AND AUTONOMIC DYSFUNCTION WITH TERFENADINE, A PERIPHERALLY ACTING ANTIHISTAMINE

RANDALL L. KOHL (Universities Space Research Association; Space Biomedical Research Institute, Houston, TX), DICK S. CALKINS (NASA, Johnson Space Center, Houston, TX), and ROBERT E. ROBINSON (Merrell Dow Pharmaceuticals, Inc., Cincinnati, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, May 1991, p. 392-396. refs

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Terfenadine (Seldane) was administered to 14 male subjects in a randomized, double-blinded, and cross-over design to assess the efficacy of this peripherally active antihistamine as an antinotion sickness drug. Terfenadine possesses practically no central side effects. A staircase profile test was administered 4 h following placebo or a single oral dose of terfenadine (300 mg). The study revealed a statistically significant therapeutic effect from terfenadine (p less than 0.05). This led to a conclusion that, because the drug does not or only poorly crosses the blood-brain barrier, a selective peripheral antihistamine action may be sufficient in the control of motion sickness induced through cross-coupled accelerative semicircular canal stimulation using a rotating chair. This finding implies that other peripherally acting agents might be found that possess even greater antinotion sickness efficacy. The present research raises additional questions regarding current theories on the etiology of motion sickness, its associated autonomic system dysfunction, and the validity of assumptions that effective pharmacological agents must act centrally. Author

A91-35417

BAROREFLEX RESPONSIVENESS DURING HYPOBARIC HYPOXIA

J. KNUDTZON, J. O. OWE (Institute of Aviation Medicine, Oslo, Norway), and H. AARS (Oslo, University, Norway) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, May 1991, p. 397-402. refs

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Baroreflex responses to graded neck suction during held expiration were studied in five healthy females at sea level and at a simulated altitude of 4572 m (15,000 ft), with and without oxygen administration. An apparent resetting of the baroreflex was observed during hypobaric hypoxia, but this effect was abolished by oxygen administration. Held expiration alone induced a pulse prolongation in all experimental conditions, however, this bradycardic response was smaller during hypobaric hypoxia than during the two normoxic conditions. When the bradycardic responses of held expiration were subtracted, the baroreflex responses to neck suction were equal in all experimental situations.

Similarly, the baroreflex was unaffected by hypobaric hypoxia when the R-R interval prolongations were expressed in percentage of the R-R intervals immediately prior to the neck suction. These data indicate that reduced ambient pressure per se has no influence on the carotid baroreflex control of heart rate. Author

A91-35419

DECOMPRESSION SICKNESS: RISK FACTORS AND THE MONOPLACE CHAMBER - A CASE REPORT

WALTER L. RUSH and SALIMI A. WIRJOSEMITO (USAF, Medical Center, Wright-Patterson AFB, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, May 1991, p. 414-417. refs

Copyright

This paper presents a case report which illustrates the principles involved in the use of monoplace chambers for the treatment of decompression sickness (DCS), as well as the concerns regarding their use expressed by Kindwall et al. (1988) and Moon (1988). The report defines a new risk factor (menstrual phase) and illustrates the risk of recurrent altitude exposure via air travel in the immediate postchamber flight period. The roles of monoplace and multiplace chambers in DCS treatment are discussed, highlighting the importance of the capacity to provide air breaks.

I.S.

A91-35420

ACCURACY OF OXYHEMOGLOBIN SATURATION MONITORS DURING SIMULATED ALTITUDE EXPOSURE OF MEN WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

WILLIAM J. MEHM, JAMES W. DOOLEY (U.S. Army, Institute of Pathology, Washington, DC), THOMAS A. DILLARD, KRISHNAN R. RAJAGOPAL (U.S. Army, Walter Reed Army Medical Center, Washington, DC; Uniformed Services University of the Health Sciences, Bethesda, MD), and BENJAMIN W. BERG (U.S. Army, Walter Reed Army Medical Center, Washington, DC) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, May 1991, p. 418-421. U.S. Army-supported research. refs

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A91-35421

A CASE OF HEMIDIAPHRAGMATIC PARALYSIS AFTER AN ANTI-G SUIT FAILURE

J. M. MORENO VAZQUEZ, J. E. CAMPILLO ALVAREZ (Extremadura, Universidad, Badajoz, Spain), J. L. GARCIA ALCON (Ejercito del Aire, Talavera AFB, Spain), F. FUENTES OTERO, and L. MURGA OPORTO (Infanta Cristina Hospital, Badajoz, Spain) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, May 1991, p. 422-424. refs

Copyright

This paper reports a case of left hemidiaphragmatic paralysis in an instructor pilot and his later recuperation. This incident was provoked by a failure in the anti-G suit, which remained inflated after the aircraft completed the maneuver that had originated the inflation. The spontaneous recuperation of both the respiratory functional test and the neurophysiological pattern are consistent with a type II Seddon's axonotmesis of the phrenic nerve. Considering the short time of regeneration (6 months), this lesion must have involved the distal portion of the phrenic nerve.

Author

A91-35422

MODAFINIL - THE UNIQUE PROPERTIES OF A NEW STIMULANT

TERENCE J. LYONS (USAF, Human Systems Div., Brooks AFB, TX) and JONATHAN FRENCH (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, May 1991, p. 432-435. refs

Copyright

Modafinil, a novel stimulant which has several remarkable features that distinguish it from other stimulants, has been developed by Lafon, a French pharmaceutical company. Unlike the amphetamines, for example, modafinil is reported to have minimal peripheral side effects at therapeutic doses. It also appears

to have a low abuse potential, does not interfere with normal sleep, and does not seem to produce tolerance. It improves vigilance especially in sleep-derived subjects. It has been used clinically for up to 3 years in the treatment of narcolepsy and idiopathic hypersomnia. It could be an ideal replacement for amphetamine in short-term operations in which fatigue might threaten the successful completion of a mission. It is recommended that military laboratories experienced in studying sustained performance include modafinil or perhaps a more selective alpha 1 receptor agonist in their investigations. Author

A91-35423#

PHYSIOLOGICAL ADAPTATION TO LIVING AND WORKING IN SPACE

WILLIAM K. DOUGLAS AIAA Student Journal (ISSN 0001-1460), vol. 28, Summer 1990, p. 12-14. refs

Copyright

Changes occurring in human physiology as a result of exposure to the space environment are briefly reviewed. Problems discussed include changes in blood volume, skeletal system, and cardiovascular system; the motion sickness phenomenon; the effects of radiation; and psychological stress. O.G.

N91-21704*# National Aeronautics and Space Administration, Washington, DC.

RADIATION HEALTH RESEARCH, 1986 - 1990

Mar. 1991 114 p

(Contract NASW-4292)

(NASA-TM-4270; NAS 1.15:4270) Avail: NTIS HC/MF A06

CSCL 06R

A collection of 225 abstracts of radiation research sponsored by NASA during the period 1986 through 1990 is reported. Each abstract was categorized within one of four discipline areas: physics, biology, risk assessment, and microgravity. Topic areas within each discipline were assigned as follows: Physics - atomic physics, nuclear science, space radiation, radiation transport and shielding, and instrumentation; Biology - molecular biology, cellular radiation biology, tissue, organs and organisms, radioprotectants, and plants; Risk assessment - radiation health and epidemiology, space flight radiation health physics, inter- and intraspecies extrapolation, and radiation limits and standards; and Microgravity. When applicable subareas were assigned for selected topic areas. Keywords and author indices are provided. Author

N91-21705# Imatran Voima Oy, Helsinki (Finland).

THE PHYSIOLOGICAL EFFECTS OF 50/60 HZ ELECTROMAGNETIC FIELDS: STANDARDS AND GUIDELINES

LEENA KORPINEN and JARNO PARTANEN (Tampere Univ. of Technology, Finland) 1990 94 p In FINNISH; ENGLISH summary

(DE91-752996; IVO-A-01/90; ISBN-951-8928-37-1;

ISSN-0782-7415) Avail: NTIS HC/MF A05

The Tampere University of Technology has started a study, The Physiological Effects of 50/60 Hz Electromagnetic Fields. The research is being financed by Imatran Voima Oy, Finnish Work Environment Fund and Tampere University of Technology. One of the objectives of this study is to examine standards and guidelines of different countries, concerning exposure to 50/60 Hz electric and magnetic fields. In German standard DIN VDE 0848, Safety in electromagnetic fields, the limit of exposure to 50/60 Hz electric fields is 20 kV/m and the limit of exposure to 50/60 Hz magnetic fields is 5 mT. IRPA (International Radiation Protection Association) has compiled the interim guidelines on limits of exposure to 50/60 Hz electric and magnetic fields. In these interim guidelines continuous occupational exposure during the working day should be limited to rms unperturbed electric field strengths not greater than 10 kV/m and to rms magnetic densities not greater than 0.5 mT. The duration of short-term occupational exposure to electric fields between 10 and 30 kV/m may be calculated from the formula $t \leq 80/E$ smaller than or equal to 80/E. Short-term occupational exposure to rms magnetic densities may not exceed 5 mT. Members of general public should not be exposed on a continuous basis to unperturbed rms electric field strengths exceeding 5 kV/m or to

magnetic flux densities exceeding 0.1 mT. When the limits were compared with the measured values of electro-magnetic fields, it was found, that in Finland occupational exposure during the working day doesn't exceed the limits. The general public exposure doesn't exceed the limits either. Comparing the results of the studies with electromagnetic fields existing in Finland, it could be noticed, that short-term exposure doesn't cause health risks in Finland. Scientific studies don't indicate, that the continuous exposure causes health risks, neither, that the continuous exposure can't cause health risks. DOE

N91-21706# Naval Biodynamics Lab., New Orleans, LA.
PHYSIOLOGY DATA ACQUISITION SYSTEM DESCRIPTION
 MARK L. LOTZ 1 Oct. 1990 51 p
 (AD-A231088; NBDL-90R004) Avail: NTIS HC/MF A04 CSDL 06/4

This technical report describes the Physiology Data Acquisition System used at NAVBIODYNLAB to acquire, record, and reproduce physiological responses from human research volunteers subjected to short duration accelerations. The system is used to acquire data such as electrocardiograms, electromyograms, and somatosensory evoked responses. The impact accelerations are provided by horizontal and vertical accelerators. This report describes the systems used for physiology data acquisition during experiments performed on the horizontal and vertical accelerators. The equipment used and the interconnection of the equipment are discussed in detail. GRA

N91-21707# Naval Air Development Center, Warminster, PA.
 Air Vehicle and Crew Systems Technology Dept.
ENHANCING TOLERANCE TO ACCELERATION (+GZ)
STRESS: THE HOOK MANEUVER Final Report, 1-14 Aug. 1990
 JAMES E. WHINNERY and DUANE C. MURRAY 20 Aug. 1990 17 p
 (AD-A231094; NADC-90088-60) Avail: NTIS HC/MF A03 CSDL 06/10

Anti-G straining maneuvers (AGSM) have been utilized by aircrew to enhance tolerance to +Gz stress and reduce the potential for +Gz-induced loss of consciousness (G-LOC). Based on many years of teaching individuals to perform an optimum AGSM, one particular technique has proven to be especially useful. This technique is referred to as the Hook maneuver. We strongly prefer not giving a particular name (such as M-1 or L-1) to the AGSM when training aircrew. The Hook maneuver simply emphasizes the proper mechanics for physiological enhancement of tolerance. Experience with training a large number of tactical aircrew on the centrifuge has proven the Hook maneuver to be an extremely effective teaching tool which is easily understood, rapidly mastered, and easily remembered. A description of the Hook maneuver has been requested by many interested groups and is described in this manuscript. It should be emphasized that the optimum AGSM for an individual aviator in a given aerial combat situation is the one that is most effective for him in that situation. GRA

N91-21708# Federal Aviation Administration, Washington, DC.
 Office of Aviation Medicine.
INHALATION TOXICOLOGY. 11: THE EFFECT OF ELEVATED TEMPERATURE ON CARBON MONOXIDE TOXICITY
 DONALD C. SANDERS and BOYD R. ENDECOTT Dec. 1990 18 p
 (AD-A231185; DOT/FAA/AM-90/16) Avail: NTIS HC/MF A03 CSDL 06/11

Laboratory rats were exposed (1) to experimental concentrations of carbon monoxide in air at ambient temperature, (2) to elevated temperature atmospheres from 40 to 60 C, and (3) to selected carbon monoxide (CO) concentrations at the elevated temperatures in (2). The incapacitating potency of each of the environments was evaluated by measurements of time-to-incapacitation ($t_{sub i}$) as a function of CO concentration and/or temperature; incapacitation was defined operationally as loss of ability to walk inside a motor-driven, rotating cage enclosed in an exposure chamber. Comparison of data from the combined

(CO + elevated temperature) exposures and exposures to CO and elevated temperatures alone indicated that incapacitation occurred earlier when CO inhalation was combined with a whole-body, elevated temperature environment than was observed for the same exposure parameters applied individually. No evidence for a synergistic effect was noted. An empirical equation was derived that allows the calculation of a predicted $t_{sub i}$ for combinations of CO and temperature within the ranges utilized in the experimental exposures. GRA

N91-21709# Naval Air Development Center, Warminster, PA.
 Air Vehicle and Crew Systems Technology Dept.
THE DEVELOPMENT OF PERCEPTUAL/MOTOR AND COGNITIVE PERFORMANCE MEASURES UNDER A HIGH-G ENVIRONMENT: A PRELIMINARY STUDY Final Report, Dec. 1988 - Apr. 1990

JOHN E. DEATON, MICHAEL HOLMES, NORMAN WARNER, and EDWARD HITCHCOCK 4 Sep. 1990 23 p
 (AD-A231289; NADC-90065-60) Avail: NTIS HC/MF A03 CSDL 05/9

There is currently a lack of data on the operator's ability to perform flight and weapon systems management functions under a high-G environment. The ability to correctly track enemy targets and respond with appropriate countermeasures is dependent upon the operator's ability to perform both perceptual/motor and cognitive functions. At the present, not enough information is available to determine how these two functions operate under high-G. GRA

N91-21710# Krug International, San Antonio, TX. Technology Services Div.
AN ANNOTATED BIBLIOGRAPHY OF HYPOBARIC DECOMPRESSION SICKNESS RESEARCH CONDUCTED AT THE CREW TECHNOLOGY DIVISION, USAF SCHOOL OF AEROSPACE MEDICINE, BROOKS AFB, TEXAS FROM 1983 TO 1988 Interim Report, 1 Jun. 1983 - 31 Mar. 1989
 JAMES T. WEBB, ROBERT W. KRUTZ, JR., and GENE A. DIXON Jun. 1990 26 p Revised
 (Contract F33615-85-C-4503)
 (AD-A231355; USAFSAM-TP-88-10R) Avail: NTIS HC/MF A03 CSDL 06/4

Four major protocols, one of which includes five studies, have been initiated or completed in the 5-year period from 1983 to 1988. The studies have resulted in numerous publications which are listed as the references for this review. The purpose of this review is to provide an accessible summary of these extensive efforts and document the history of their accomplishments. The cross-reference information contained in this review is intended to simplify data accession within both published and data base records. A listing of the abbreviated title, protocol approval information, sponsorship information, computer database (HYPOB) retrieval numbers/titles, dates of exposure, and information about subjects, prebreathe, and exposure parameters for each study is followed by the published abstracts from each publication. GRA

N91-22703*# Texas Univ., El Paso. Dept. of Electrical Engineering.
INTERDISCIPLINARY INVESTIGATIONS IN SUPPORT OF PROJECT DI-MOD Semiannual Progress Report, Sep. 1990 - Apr. 1991
 SCOTT A. STARKS 1991 61 p
 (Contract NAG2-670)
 (NASA-CR-188098; NAS 1.26:188098) Avail: NTIS HC/MF A04 CSDL 06/16

Interdisciplinary investigations in support of project DI-MOD are discussed. The following subject areas were covered: (1) potential extensions of Project DI-MOD to additional sites in Central America; (2) human migration patterns and their impact on malaria transmission; and (3) an investigation into possible computer-based approaches to the analysis of remotely sensed multispectral data. Author

N91-22704*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
INDEX OF MATERIAL SAFETY DATA SHEETS: TOXIC SUBSTANCES REGISTRY SYSTEM
 Apr. 1991 696 p
 (NASA-GP-23-1; NAS 1.2:23-1) Avail: NTIS HC/MF A99 CSCL 06/5

The Material Safety Data Sheets (MSDSs) listed in this index reflect product inventories and associated MSDSs which have been submitted to the Toxic Substance Registry database maintained by the Base Operations Contractor at the Kennedy Space Center. The purpose of this index is to provide a means to access information on the hazards associated with the toxic and otherwise hazardous chemicals stored and used at the Kennedy Space Center. Author

N91-22705# Cambridge Univ. (England). Dept. of Experimental Psychology.
ACQUISITION AND PROCESSING OF INFORMATION DURING STATES OF RAPID EYE MOVEMENT (REM) SLEEP AND SLOW-WAVE SLEEP Final Report, Mar. - Jun. 1989
 JOHN D. MOLTON Jul. 1990 29 p
 (Contract DAJA45-89-M-0125)
 (AD-A231772; R/D-6231-RB-09) Avail: NTIS HC/MF A03 CSCL 05/8

This report reviews, analyzes, and summarizes experimental literature on 'sleep learning.' Findings are as follows: (1) Serious methodological flaws were found in all reported positive results. There is no evidence that semantic learning occurs when verbal material is presented to sleeping subjects. (2) A critical, but open-minded, test of sleep learning has not been done. Recommendations are made for an appropriate experiment. (3) If new material is presented to the sleeping subject, there is danger that it may interfere with normal nighttime processing of earlier daytime experiences. GRA

N91-22706# Army Aeromedical Research Lab., Fort Rucker, AL.
CODING MANUAL FOR THE US ARMY AVIATION EPIDEMIOLOGY DATA REGISTER
 THOMAS J. BURKE and RENEE KINGSLEY Jan. 1991 59 p
 (AD-A231885; USAARL-91-4) Avail: NTIS HC/MF A04 CSCL 05/9

The U.S. Army Aviation Epidemiology Data Register (AEDR) is an automated database which allows electronic storage, analysis, and retrieval of information of the Flying Duty Medical Examination (FDME). The FDME consists of a completed Report of Medical History (standard form (SF) 93), Report of Physical Examination (SF 88), Report of Electrocardiogram SF 520) with the electrocardiogram tracing, and for certain classes of FDME, additional information on lifestyle factors and family history. Demographic data, patient history, physician history, physical findings, screening tests, and diagnoses information are included on these forms, each of which has a unique value in health care, administration, and research, and each of which must be handled differently in the AEDR. Demographic and screening test results are entered directly from the FDME to the AEDR. History, physical findings, and diagnoses are translated into a standardized alphanumeric code, a modification of the International Classification of Diseases (ICD). Because of the unique characteristics of the military aviation environment, the ICD is inadequate to support all the clinical, administrative, and research functions of the AEDR. The ICD has been supplemented with additional diagnostic codes to provide extra specificity, codes for physical findings and electrocardiograms, and codes to automate the administrative process. These codes are discussed. GRA

N91-23030*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
X RAY IMAGING MICROSCOPE FOR CANCER RESEARCH
 RICHARD B. HOOVER, DAVID L. SHEALY, B. R. BRINKLEY, PHILLIP C. BAKER, TROY W. BARBEE, JR., and ARTHUR B. C. WALKER, JR. (Stanford Univ., CA.) In National Aeronautics and

Space Administration, Technology 2000, Volume 1 p 73-82 Mar. 1991
 (Contract NSG-5131; W-7405-ENG-48)
 Avail: NTIS HC/MF A18 CSCL 14/2

The NASA technology employed during the Stanford MSFC LLNL Rocket X Ray Spectroheliograph flight established that doubly reflecting, normal incidence multilayer optics can be designed, fabricated, and used for high resolution x ray imaging of the Sun. Technology developed as part of the MSFC X Ray Microscope program, showed that high quality, high resolution multilayer x ray imaging microscopes are feasible. Using technology developed at Stanford University and at the DOE Lawrence Livermore National Laboratory (LLNL), Troy W. Barbree, Jr. has fabricated multilayer coatings with near theoretical reflectivities and perfect bandpass matching for a new rocket borne solar observatory, the Multi-Spectral Solar Telescope Array (MSSTA). Advanced Flow Polishing has provided multilayer mirror substrates with sub-angstrom (rms) smoothness for the astronomical x ray telescopes and x ray microscopes. The combination of these important technological advancements has paved the way for the development of a Water Window Imaging X Ray Microscope for cancer research. Author

N91-23031*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
MECHANICAL RESPONSE TISSUE ANALYZER FOR ESTIMATING BONE STRENGTH
 SARA B. ARNAUD, CHARLES STEELE, and ANTHONY MAURIELLO (GaitScan, Inc., Ridgewood, NJ.) In National Aeronautics and Space Administration, Technology 2000, Volume 1 p 83-88 Mar. 1991
 Avail: NTIS HC/MF A18 CSCL 14/2

One of the major concerns for extended space flight is weakness of the long bones of the legs, composed primarily of cortical bone, that functions to provide mechanical support. The strength of cortical bone is due to its complex structure, described simplistically as cylinders of parallel osteons composed of layers of mineralized collagen. The reduced mechanical stresses during space flight or immobilization of bone on Earth reduces the mineral content, and changes the components of its matrix and structure so that its strength is reduced. Currently, the established clinical measures of bone strength are indirect. The measures are based on determinations of mineral density by means of radiography, photon absorptiometry, and quantitative computer tomography. While the mineral content of bone is essential to its strength, there is growing awareness of the limitations of the measurement as the sole predictor of fracture risk in metabolic bone diseases, especially limitations of the measurement as the sole predictor of fracture risk in metabolic bone diseases, especially osteoporosis. Other experimental methods in clinical trials that more directly evaluate the physical properties of bone, and do not require exposure to radiation, include ultrasound, acoustic emission, and low-frequency mechanical vibration. The last method can be considered a direct measure of the functional capacity of a long bone since it quantifies the mechanical response to a stimulus delivered directly to the bone. A low frequency vibration induces a response (impedance) curve with a minimum at the resonant frequency, that a few investigators use for the evaluation of the bone. An alternative approach, the method under consideration, is to use the response curve as the basis for determination of the bone bending stiffness EI (E is the intrinsic material property and I is the cross-sectional moment of inertia) and mass, fundamental mechanical properties of bone. Author

N91-23032*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ADAPTATION OF NASA TECHNOLOGY FOR THE OPTIMIZATION OF ORTHOPEDIC KNEE IMPLANTS
 D. A. SARAVANOS, P. J. MRAZ (Case Western Reserve Univ., Cleveland, OH.), and D. A. HOPKINS In National Aeronautics and Space Administration, Technology 2000, Volume 1 p 89-98 Mar. 1991

(Contract NAG3-1027)

Avail: NTIS HC/MF A18 CSCL 05/8

The NASA technology originally developed for the optimization of composite structures (engine blades) is adapted and applied to the optimization of orthopedic knee implants. A method is developed enabling the tailoring of the implant for optimal interaction with the environment of the tibia. The shape of the implant components are optimized, such that the stresses in the bone are favorably controlled to minimize bone degradation and prevent failures. A pilot tailoring system is developed and the feasibility of the concept is elevated. The optimization system is expected to provide the means for improving knee prosthesis and individual implant tailoring for each patient. Author

N91-23066*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

URODYNAMIC PRESSURE SENSOR

THOMAS MOORE /in National Aeronautics and Space Administration, Technology 2000, Volume 1 p 363-369 Mar. 1991

Avail: NTIS HC/MF A18 CSCL 14/2

A transducer system was developed for measuring the closing pressure profile along the female urethra, which provides up to five sensors within the functional length of the urethra. This new development is an improvement over an earlier measurement method that has a smaller sensor area and was unable to respond to transient events. Three sensors were constructed; one of them was subjected to approximately eight hours of use in a clinical setting during which 576 data points were obtained. The complete instrument system, including the signal conditioning electronics, data acquisition unit, and the computer with its display and printer is described and illustrated. Author

53

BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A91-33165

OPERATOR'S ACTIVITY IN AN ARID-ZONE INDUSTRIAL ENVIRONMENT [OPERATORSKAIA DEIATEL'NOST' V PROIZVODSTVENNYKH USLOVIAKH ARIDNOI ZONY]

G. N. SADIKOV, P. G. KOLOIAROV, and V. I. LAVRINENKO (AN TSSR, Institut Fiziologii i Eksperimental'noi Patologii Aridnoi Zony, Ashkhabad, Turkmen SSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 17, Jan.-Feb. 1991, p. 132-139. In Russian. refs

Copyright

The effects of climatic and environmental conditions of the hot arid climate in the southeastern Kara-Kum desert on various categories of memory and thinking processes were investigated in two groups of operators performing either of the two types of activity: the sensory type (working at control boards) or the sensomotor type (controlling several types of equipment situated in an open area). The work regimen consisted of 24-hr-long work shifts followed by 72-hr-long rest periods. Results obtained from a battery of psychophysiological tests showed that the parameters of cognitive activity, such as operational memory and replicative thinking, were more stable to environmental conditions than were sensomotor reactions. I.S.

A91-34022

COLUMBUS ASTRONAUT TRAINING IN THE CREW TRAINING COMPLEX AT DLR

HANSULRICH STEIMLE (DLR, Cologne, Federal Republic of Germany) (Columbus VI - Symposium on Space Station Utilization, 6th, Bremen, Federal Republic of Germany, Apr. 24-26, 1990, Proceedings. A91-34016 13-12) Space Technology - Industrial and

Commercial Applications (ISSN 0892-9270), vol. 11, no. 2, 1991, p. 91-98.

Copyright

The Crew Training Complex (CTC) that is being built at DLR, (Cologne, Germany) is described together with the elements of the training program for European astronauts. Special attention is given to the individual CTC facilities and their use, the typical training flow, the overall astronaut training sequence, and the Columbus/Hermes crew preparation. I.S.

A91-34825#

ON THE HUMAN VISUAL SYSTEM - FUNDAMENTAL EXPERIMENTS OF THE HUMAN MOTION PERCEPTION

HIROMITSU HAMA, KAZUMI YAMASHITA (Osaka City University, Japan), and HITOSHI TAKADA Osaka City University, Faculty of Engineering, Memoirs (ISSN 0078-6659), vol. 31, Dec. 1990, p. 219-227. refs

A method is described for the analyzing human motion perception by using moving random dot patterns. In the procedure, subjects are confronted with two pictures formed by random dot patterns, one forming a significant image ('the hand image') and the other forming noise image. Displaying the two images at once on the screen, the hand image is moved and the degree of structure restoration of this image is graded. Results showed that, when the densities of random dot in the hand image and in the noise image were very similar, the degree of structure restoration was high. In a case of large visual angle, the degree of structure restoration was low. Motion perception was affected both by the size of a dot (spatial frequency) and by the moving speed (temporal frequency). I.S.

A91-34906

HUMAN ERROR AVOIDANCE TECHNIQUES; PROCEEDINGS OF THE 2ND CONFERENCE, HERNDON, VA, SEPT. 18, 19, 1989

Conference sponsored by SAE. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, 102 p. For individual items see A91-34907 to A91-34918.

(SAE P-229) Copyright

The proceedings concentrate on the development of a national plan for addressing future aviation human-factor needs, the behavioral characteristics of effective crew leaders, leader personality as it relates to crew effectiveness, and the role of professional standards in cockpit resource management. The effectiveness of cockpit resource-management training is evaluated, along with human factors and information transfer. Human-performance factors in aircraft accident investigations, pilot hiring criteria, and cockpit resource-management concepts in flight training and checking are discussed. The ergonomic integrated flight deck, error-tolerant avionics and displays, and workload and automation are considered. V.T.

A91-34907

DEVELOPMENT OF A NATIONAL PLAN FOR ADDRESSING FUTURE AVIATION HUMAN FACTORS NEEDS

H. CLAYTON FOUSHEE (FAA, Washington, DC) IN: Human error avoidance techniques; Proceedings of the 2nd Conference, Herndon, VA, Sept. 18, 19, 1989. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, p. 11-16.

(SAE PAPER 892600) Copyright

Human-factor research and development efforts in the United States aimed at the alleviation of human-performance problems in all types of aircraft, in the air-traffic control environment, and in the interaction of the two environments are reviewed. The application of automation and advanced technology is outlined, and emphasis is placed on empirical investigations utilizing high-fidelity simulation techniques. Aviation-system monitoring, research in the field of aviation human-performance factors and its measurements, and information transfer are discussed. The design of controls, displays, and workstations is addressed, along with personnel training, and certification and validation standards for aircraft or air-traffic control systems. V.T.

A91-34908* Texas Univ., Austin.

EVALUATING THE EFFECTIVENESS OF COCKPIT RESOURCE MANAGEMENT TRAINING

ROBERT L. HELMREICH (Texas, University, Austin) IN: Human error avoidance techniques; Proceedings of the 2nd Conference, Herndon, VA, Sept. 18, 19, 1989. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, p. 17-22. FAA-supported research. refs

(Contract NCC2-286)

(SAE PAPER 892601) Copyright

The concept of providing flight crews with intensive training in crew coordination and interpersonal skills (cockpit resource management training - CRM) is outlined with emphasis on full mission simulator training (line-oriented flight training - LOFT). Findings from several airlines that have instituted CRM and LOFT are summarized. Four types of criteria used for evaluating CRM programs: observer ratings of crew behavior, measures of attitudes regarding cockpit management, self-reports by participants on the value of the training, and case studies of CRM-related incidents and accidents are covered. Attention is focused on ratings of the performance of crews during line flights and during simulator sessions conducted as a part of LOFT. A boomerang effect - the emergence of a subgroup that has changed the attitudes in the opposite direction from that desired is emphasized. V.T.

A91-34909* Air Force Academy, CO.

BEHAVIORAL CHARACTERISTICS OF EFFECTIVE CREW LEADERS

ROBERT C. GINNETT (U.S. Air Force Academy, Colorado Springs, CO) IN: Human error avoidance techniques; Proceedings of the 2nd Conference, Herndon, VA, Sept. 18, 19, 1989. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, p. 23-31. refs

(Contract NCC2-324)

(SAE PAPER 892602) Copyright

The behaviors of effective versus less effective captains as they form and lead their crews in line operations are analyzed. The research examines real work groups in an actual organization with a specific and consequential task to perform and is based on a normative model of work group effectiveness. Selection of captains is outlined, as well as data collection over the course of six months of crew and cockpit observations including over 300 hours of direct crew observations and 110 hours of actual flight time. Common characteristics of the effective leaders as well as the deviations of the less effective are described, and organizational implications are assessed. The concept of 'shells' depicted as a series of concentric circles moving outward from the group's task execution at the center is introduced and discussed. V.T.

A91-34910

THE ROLE OF PROFESSIONAL STANDARDS IN COCKPIT RESOURCE MANAGEMENT (CRM)

JAMES A. MCINTYRE (Air Line Pilots Association, Washington, DC) IN: Human error avoidance techniques; Proceedings of the 2nd Conference, Herndon, VA, Sept. 18, 19, 1989. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, p. 39-41. refs

(SAE PAPER 892604) Copyright

The paper examines the role of professional standards peer-group committees in dealing with the 'boomerang' effect when the pilot reacts contradictory to CRM training and emerges with a negative change in attitudes. It is pointed out that there is a general agreement that pilot peer pressure exerted through their own professional standards committees (PSC) may provide an effective interim method of dealing with the problem of such an aberrant behavior in the cockpit. The success of such committees is determined by the pilot group's voluntary dedication to overcoming personality conflicts and other stress factors that affect flight safety. The involvement of the Air Line Pilots Association PSC in a dispute between the union leadership and management is discussed. V.T.

A91-34913

AMERICAN AIRLINES' PILOT HIRING CRITERIA

WILLIAM A. JAMES (American Airlines, Inc., Dallas, TX) IN:

Human error avoidance techniques; Proceedings of the 2nd Conference, Herndon, VA, Sept. 18, 19, 1989. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, p. 57-59.

(SAE PAPER 892609) Copyright

An approach aimed at enhancements of individual's performance as pilot-in-command as his career progresses to the captain position is outlined, and characteristics desirable for future captains, including strong career motivation toward the field of aviation, ability to solve problems by logical reasoning, mature personality free from neurotic symptoms, and ability to perform well under stress are listed. A centralized pilot-selection process consisting of four phases is described. In phase one, the personnel department screens applications for basic qualifications; in phase two, the selected applicants are given a personal interview; in phase three, a test battery designed for screening applicants for the desirable characteristics is administered; and in phase four, the applicants are rank ordered based on a composite score derived from the various elements of the process. V.T.

A91-34914

COCKPIT RESOURCE MANAGEMENT

H. C. ALGER (Delta Airlines, Inc., Atlanta, GA) IN: Human error avoidance techniques; Proceedings of the 2nd Conference, Herndon, VA, Sept. 18, 19, 1989. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, p. 61-67.

(SAE PAPER 892610) Copyright

A cockpit-resource-management program at Delta Airlines is reviewed. In the first phase of the program, a one and a half day workshop is presented to pilots and other personnel. In the next stage, crew-resource-management directions coupled with continued emphasis on good cockpit discipline, a strong training effort, and continued reinforcement of resource-management skills will be implemented. The achievements of the CRM steering committee at Delta are outlined, and attention is given to a workshop devoted to team issues and followed by a full-length high-impact LOFT session, designed to place the crew into difficult scenarios requiring a high level of CRM skills. Focus is placed on crew dynamics, communications, decision dynamics, and crew effectiveness. V.T.

A91-34915

CRM CONCEPTS IN FLIGHT TRAINING AND CHECKING

CLIFF LAWSON (United Airlines, Chicago, IL) IN: Human error avoidance techniques; Proceedings of the 2nd Conference, Herndon, VA, Sept. 18, 19, 1989. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, p. 69-72.

(SAE PAPER 892611) Copyright

The paper concentrates on three major areas of flight training and checking where CRM principles are incorporated: annual recurrent training with LOFT, annual recurrent with proficiency check, and transition and upgrade. Realistic scenarios and noninvolvement by the instructor are emphasized for LOFT, and it is noted that the problems should not be very easy but at the same time should not be so difficult that they induce crew failure regularly. The annual proficiency check is considered to be one of the best vehicles for the reinforcement of CRM skills. Focus is placed on transition and upgrade training where pilots are most likely to make behavior and attitude changes. The rating ride and the role of the instructor are discussed. V.T.

A91-35943 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

VISUAL SENSITIVITY TO SPATIALLY SAMPLED MODULATION IN HUMAN OBSERVERS

JEFFREY B. MULLIGAN (NASA, Ames Research Center, Moffett Field; California, University, La Jolla) and DONALD I. A. MACLEOD (California, University, La Jolla) Vision Research (ISSN 0042-6989), vol. 31, no. 5, 1991, p. 895-905. NASA-supported research. refs

(Contract NIH-EY-01711)

Copyright

Thresholds were measured for detecting spatial luminance modulation in regular lattices of visually discrete dots. Thresholds

for modulation of a lattice are generally higher than the corresponding threshold for modulation of a continuous field, and the size of the threshold elevation, which depends on the spacing of the lattice elements, can be as large as a one log unit. The largest threshold elevations are seen when the sample spacing is 12 min arc or greater. Theories based on response compression cannot explain the further observation that the threshold elevations due to spatial sampling are also dependent on modulation frequency: the greatest elevations occur with higher modulation frequencies. The idea that this is due to masking of the modulation frequency by the spatial frequencies in the sampling lattice is considered.

Author

N91-21711# Air Force Human Resources Lab., Brooks AFB, TX.

A CONCEPTUAL MODEL OF THE PERFORMANCE OF THE UNITED STATES AIR FORCE FLIGHT TRAINING PROGRAM
Final Report

JOHN P. MCGARRITY, LARRY T. LOOPER, and R. S. CURTIS
Jan. 1991 14 p
(AD-A230881; AFHRL-TP-88-33) Avail: NTIS HC/MF A03
CSCL 05/6

A conceptual approach is presented for measuring the program performance of the Air Force Flight Training Program (FTP). There are five sections: The introduction provides the background information on four different FTP options addressed by Stoker, Hunter, Kanto, Quebe, and Siem (1987) and establishes the general construction of the program performance model; the second section addresses the effectiveness of the FTP in relation to graduation rates; the efficiency section develops the cost for each of the FTP options; the fourth section, on performance, presents a way to compare the efficiency and effectiveness of each program; and the concluding section provides a summary of the benefits to be derived from use of one of the four options.

GRA

N91-22707# Stanford Univ., CA. Dept. of Psychology.
DECISION UNDER CONFLICT Annual Report, No. 2, 1 Dec. 1989 - 30 Nov. 1990
AMOS TVERSKY 21 Nov. 1990 12 p
(Contract AF-AFOSR-0064-89; AF PROJ. 2313)
(AD-A231109; AFOSR-90-1216TR) Avail: NTIS HC/MF A03
CSCL 05/8

The present report summarizes two projects. The first project, which focuses on riskless choice, involves a series of experiments that demonstrate the phenomenon of loss aversion: losses and disadvantages have greater impact on preference than gains and advantages. The evidence shows that choice depends on the status quo or reference level, and that changes of reference point often lead to reversals of preference. To account for these observations, we develop a reference-dependent theory of individual choice, which explains such effects by a deformation of the preference map about the reference point. Implications of loss aversion to both individual and aggregate behavior are explored. The second project, which focuses on decision under uncertainty, extends prospect theory by incorporating a cumulative (i.e., rank-dependent) weighting scheme. In this model, the carriers of value are gains and losses, defined relative to a reference point, and the impact of uncertainty is summarized by different weighting functions for gains or for losses. Two evaluation principles -- diminishing sensitivity and loss aversion are invoked to explain the characteristic curvature of the value function and the weighting functions. A review of the experimental evidence and the results of a new experiment reveal a distinctive four-fold pattern of risk attitudes: risk aversion for gains and risk seeking for losses of high probability; risk seeking for gains and risk aversion for losses of low probability.

Author

N91-22708# British Columbia Univ., Vancouver. Dept. of Psychology.
PSYCHOLOGICAL ANALYSES OF COURAGEOUS PERFORMANCE IN MILITARY PERSONNEL Interim Report
No. 2, Dec. 1987 - Dec. 1988
S. RACHMAN Aug. 1990 32 p

(Contract DAJA45-87-C-0009)

(AD-A231774; R/D-4158A-RB-01) Avail: NTIS HC/MF A03
CSCL 05/9

This research reports on the second year of the project to identify psychological markers of courageous military performance. Findings indicate that means and standard deviations of heart rate responses of 28 bomb disposal operators during a lab stress test are similar to patterns recorded for previous groups of operators. Individual profiles were constructed for each operator. Physiological and psychometric data for the operators are internally consistent, but weakly correlated with each other. Preliminary analyses indicate that, as expected, low anxiety and heart rate activity is associated with superior performance in the field. Moreover, decorated operators responded stably and without anxiety during pre-tour stress tests. Early results on optimism and courage form no clear pattern.

GRA

N91-22709# Wright State Univ., Dayton, OH. Human Factors Engineering.

THE ROLE OF TRAINING, INDIVIDUAL DIFFERENCES AND KNOWLEDGE REPRESENTATION IN COGNITIVE-ORIENTED TASK PERFORMANCE Interim Report, 1 Nov. 1989 - 31 Oct. 1990

RICHARD J. KOUBEK Dec. 1990 24 p
(Contract N00014-90-J-1256)

(AD-A231798) Avail: NTIS HC/MF A03 CSCL 05/8

This research examines the impact of training style, individual differences and task representation on automatized task performance and controlled task performance. Results indicate that performance on relatively straightforward repetitive tasks, usually associated with automatization, is influenced by training style and the mental task representation held by individuals. Also, task representation is a significant determinant of performance on complex cognitive-oriented tasks (i.e., controlled process tasks). Therefore, the task representation is suggested as a high level determinant for both simple and complex task performance. No effect for individual differences was found. It is concluded that training programs and task design for these type of activities must account for the representation in an effort to maximize individual performance.

GRA

N91-22710# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA.

THE SELECTION OF AN EXPERIMENTAL TEST BATTERY FOR AVIATOR COGNITIVE, PSYCHOMOTOR ABILITIES, AND PERSONAL TRAITS Interim Report, Jan. - Jul. 1987

GABRIEL P. INTANO, WILLIAM R. HOWSE, and RONALD J. LOFARO Jan. 1991 29 p
(AD-A231887; ARI-RN-91-21) Avail: NTIS HC/MF A03 CSCL 05/8

In late 1986, the U.S. Army Aviation Center (USAAVNC) redesigned the Initial Entry Rotary Wing (IERW) course for aviator candidates. The new training is called IERW Multitrack (IERW-MT) and became operative in May 1988. The research problem for the U.S. Army Research Institute Aviation R&D Activity (ARIARDA) was to develop tests and procedures for selecting aviator candidates for one of four helicopters prior to training day 100. ARIARDA simultaneously pursued two avenues of research. On the one hand, available test instruments were considered and evaluated for their potential to discriminate among aviators. On the other hand, groups of Subject Matter Experts (SMEs) developed *criticality-rated aviator candidate abilities and traits for specific operational helicopters*. Extensive literature reviews and liaison with sister services and other agencies were accomplished. Four test instruments were evaluated for use. The underlying abilities, traits, and skills these batteries purported to measure matched the abilities, traits, and skills identified as necessary by the SMEs for each of their helicopters. Upon selection of the subjects contained in the ARIARDA experimental test battery, high-time aviators were given the experimental battery to develop scoring profiles for specific aircraft and to generate the data for the statistical analyses that resulted in the Preliminary Multi-Track Classification Algorithm.

GRA

N91-22711# Los Alamos National Lab., NM.

LINKING STRUCTURE AND FUNCTION: INFORMATION PROCESSING IN THE BRAIN

M. A. V. GREMILLION 1990 24 p Presented at the 1990 Santa Fe Institute Summer School on Complex Systems, Santa Fe, 12-16 Jun. 1990

(Contract W-7405-ENG-36)

(DE91-009946; LA-UR-91-829; CONF-9006299) Avail: NTIS HC/MF A03

Traditionally, theories of function in neuroscience have emerged from physiology. Physiologists have suggested a number of means by which information in the brain can be processed, yet the principles underlying the generation of these phenomena are not well understood. A complex systems approach would be to examine the overall structure and function of the system and to attempt to establish a common framework for information processing interactions. This paper will use the structure-function relationship as a basis for exploring units of information processing. It will examine the brain as a whole, first providing the non-specialists with an short overview of the structure and some of the functions or outputs of the brain. It then very briefly reviews three of the prominent theoretical concepts that have emerged in the last few decades: receptive fields, feature extraction, and parallel processing. Next, it addresses the question of information processing and outlines the structures which have traditionally been proposed to be the basic unit of information processing. An alternative unit on which information processing in the brain might be based is then proposed, and data outlined to support it. Finally, the implications of this different mode of processing are discussed, both for the brain and for other complex systems. DOE

N91-22885# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne (Germany, F.R.).

ASTRONAUT TRAINING [ASTRONAUTENTRAINING]

RENATE BRUEMMER *In its* Fourth Summer School on Microgravity: Conference Summaries and Forum Lectures p 13-20 Aug. 1990 In ENGLISH and GERMAN

Avail: NTIS HC/MF A10

The training concept is defined. The astronauts should perfectly understand the experiments performed during spaceflight and they should be familiar with the payload onboard the Spacelab. The aim of the training is to give the required knowledge to astronauts and to foster the formation of a team. As a D2 mission is being prepared and further Spacelab flights are envisaged, training phases, basic training, lectures, operational training, simulation, and orbiter crew training are described. ESA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A91-33272

AIRCREW INTEGRATED SURVIVAL ARMOR PROTECTION (AISAP) FOR USN/USMC HELO AIRCREW

CHRIS WHITE (U.S. Navy, Naval Air Development Center, Warminster, PA) and BRIAN HARVEY (STV/Sanders and Thomas, Inc., Pottstown, PA) SAFE Journal, vol. 21, Spring 1991, p. 9-12.

Copyright

This paper describes the design of the integrated aircrew survival and armor protection (AISAP) system being developed by the AISAP program to replace the current T-65 body armor, SV-2B survival vest, and LPU-series aircrew flotation assembly, which are incompatible. The final AISAP configuration will be a completely new integrated survival and armor protection system which will

provide 0.30 caliber AP insert plates for ballistic protection, jettisonable armor plates for in-water capability, pockets for survival items, lift capability, and flotation capability. I.S.

A91-33274

COMBAT EDGE - A TEST SUBJECT PERSPECTIVE

LLOYD D. TRIPP, JR. (Systems Research Laboratories, Inc., Dayton, OH) SAFE Journal, vol. 21, Spring 1991, p. 21-25.

Copyright

The current version of G-protection equipment known as the Combined Advanced Technology Enhanced Design G-Ensemble (COMBAT EDGE) is described, and the results of man-rating tests conducted on the USAFSAM centrifuge are presented. The acceleration levels used in the man-rating tests included a graduate onset rate of 0.1 G/s to +9 Gz; a rapid onset rate (ROR) of 3-4 G/s to +5, +7, and +9 Gz, with plateaus lasting for 15 s each; and a ROR of +5 to +9 Gz Simulated Aerial Combat Maneuver using 10-s plateaus. The lessons learned from the tests are discussed. I.S.

A91-33670* Texas Univ., Austin.

SIX-DEGREE-OF-FREEDOM SIMULATION OF AN ASTRONAUT DETUMBLE SYSTEM

W. T. FOWLER (Texas, University, Austin) and J. M. NEFF Journal of the Astronautical Sciences (ISSN 0021-9142), vol. 39, Jan.-Mar. 1991, p. 3-20. refs

(Contract NGT-50222)

Copyright

The problem of stabilizing the attitude of an untethered astronaut in a three-axis tumble is addressed. A simple six thruster detumbling system mounted on the astronaut's Portable Life Support System backpack is analyzed as a possible solution. A six-degree-of-freedom dynamical model is constructed using the Clohessy-Wiltshire equations, Euler's moment equations, and quaternions. The six thruster system produces both moments and forces when activated. However, it is shown that the thrust forces acting on the body during detumbling do not significantly affect the translational motion. Author

A91-34258

SPACE SUITS FOR EVA [AUSGEH-ANZUG FUER DEN WELTRAUM]

HELGA L. HILLEBRAND Luft- und Raumfahrt (ISSN 0173-6264), vol. 12, no. 1-2, 1991, p. 16-18. In German.

Copyright

Space suits being developed for use with the Columbus Free Flyer are discussed. The basic physical problems of pressure which the design of the suits must meet are reviewed, showing the ways that existing suits deal with them. The choice of materials for the suits and the design of their joints, and the composition of their individual layers are addressed. The industrial organization which is developing the suits is depicted. C.D.

A91-34911* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

HUMAN FACTORS AND INFORMATION TRANSFER

ALFRED T. LEE (NASA, Ames Research Center, Moffett Field, CA) IN: Human error avoidance techniques; Proceedings of the 2nd Conference, Herndon, VA, Sept. 18, 19, 1989. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, p. 43-48.

(SAE PAPER 892607) Copyright

Key problem areas in the management and transfer of information in the National Airspace System, contributing to human errors are identified. Information-management aspects supporting the user's ability to assess prevailing situations accurately with adequate time to make an informed decision are considered. The relationship between judgment biases and requirements for managing weather information is illustrated by examining such hazardous weather phenomena as microbursts and windshears. The system of air-ground communication relying almost exclusively on voice transmissions is discussed, and recommendations in the areas of communications procedures and technology development are provided. V.T.

A91-34916

THE ERGONOMIC INTEGRATED FLIGHT DECK

GERALD STONE (Douglas Aircraft Co., Long Beach, CA) IN: Human error avoidance techniques; Proceedings of the 2nd Conference, Herndon, VA, Sept. 18, 19, 1989. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, p. 73-85. refs (SAE PAPER 892612) Copyright

A coordinated flight deck design concept is presented, which takes into account human capabilities and limitations such as fit and function, seating, internal and external vision, reach, and safety. In addition to incorporating operational requirements, the concept covers amenities such as coffee cup holders, footrests, provisions for food service, storage of personal items such as suitcases and clothing, and maps, flight manuals, and charts. The design is brought together with computer-aided drafting procedures as well as sophisticated human modeling techniques, enabling a step-by-step assessment of the resulting configuration. Author

A91-34917

ERROR TOLERANT AVIONICS AND DISPLAYS

DELMAR M. FADDEN (AIAA, Washington, DC; IEEE, New York; Boeing Commercial Airplanes, Seattle, WA) IN: Human error avoidance techniques; Proceedings of the 2nd Conference, Herndon, VA, Sept. 18, 19, 1989. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, p. 87-91. refs (SAE PAPER 892613) Copyright

Operating procedures, human performance, and equipment capabilities are analyzed from the point of view of human-error reduction and tolerance. It is shown that a task analysis initiated before the detailed design work is begun improves the utility of design guidelines and contributes to fewer revisions and less backtracking in the latter phases of design. Three case histories demonstrating the approach are outlined: one is related to systems controls and the other two are related to displays. Focus is placed on a fire-switch design, graphic navigation-data display, and CRT-color selection. The relationship between equipment design, operating procedures and training, and pilot performance are emphasized. V.T.

A91-34918

WORKLOAD AND AUTOMATION

JEAN-JACQUES SPEYER (Airbus Industrie, Blagnac, France) and RICHARD D. BLOMBERG (Dunlap and Associates, Inc., Norwalk, CT) IN: Human error avoidance techniques; Proceedings of the 2nd Conference, Herndon, VA, Sept. 18, 19, 1989. Warrendale, PA, Society of Automotive Engineers, Inc., 1989, p. 93-101. refs Copyright

Current and future generations of transport aircraft are characterized by a high level of automation. This automation is intended to assist the flight crew and make it possible for a crew of two persons to operate these aircraft for all types of flights, including those of extremely long duration. While one of the design goals of automation is to reduce crew workload, little is known about the true relationship between workload and automation. This paper discusses the approaches taken by Airbus Industrie when designing increasing levels of automation into their aircraft. It also addresses the Airbus program of workload research and the need to direct specific attention to the relationship between workload and automation. Author

A91-34929#

COOPERATIVE CONTROL OF MULTIPLE SPACE MANIPULATORS

M. NAHON and J. ANGELES (McGill University, Montreal, Canada) IN: CASI Conference on Astronautics, 6th, Ottawa, Canada, Nov. 19-21, 1990, Proceedings. Ottawa, Canadian Aeronautics and Space Institute, 1990, p. 28-37. Ministere de l'Education du Quebec-supported research. refs (Contract NSERC-A-4532)

The control of multiarmed robotic systems is inherently more complex than that of single-arm systems. Whereas a single manipulator can be controlled purely through positions or velocities, multiple manipulators handling a common payload must also be

controlled in terms of forces. In this paper, the problem of finding force setpoints for the controller is formulated as a constrained optimization problem where the constraints are provided by the dynamics equations and the actuator capabilities. A number of potential objective functions which may be minimized are reviewed including the 'internal force', a norm of the vector of actuator torques, and power losses in the system. These are then compared for a task in which the Special Purpose Dexterous Manipulator moves a payload in the absence of gravity. It is concluded that the actuator torque criterion appears to offer the worst compromise in performance, while the minimum internal force and minimum power loss criteria each have their advantages. Author

A91-34930#

VISION SYSTEM REQUIREMENTS AND CONCEPT FOR THE SPECIAL PURPOSE DEXTEROUS MANIPULATOR SYSTEM (SPDM)

LEON ZUCHERMAN (Spar Aerospace, Ltd., Mississauga, Canada) IN: CASI Conference on Astronautics, 6th, Ottawa, Canada, Nov. 19-21, 1990, Proceedings. Ottawa, Canadian Aeronautics and Space Institute, 1990, p. 38-44. NSERC-supported research. refs

An account is presented of the design features and operational capabilities of the Artificial Vision System (AVS) employed by the Canadian Space Station Program's Special Purpose Dexterous Manipulator (SPDM) in its tracking, capturing, handling, berthing, and tool-manipulation operations. A comparison of the performance of SPDM vision-assisted operations with those of the Space Station Remote Manipulator System shows that the SPDM operations in general, and its maintenance and assembly operations in particular, involve an additional dimension of task complexity that must be matched by AVS performance. Alternative future concepts in the field of SPDM-related vision are discussed. O.C.

A91-34932#

AN ACTIVE TACTILE PERCEPTION SYSTEM

E. PETRIU, M. GREENSPAN, F. GELINAS (Ottawa, University, Canada), W. S. MCMATH, and S. K. YEUNG (Canadian Space Agency, Ottawa, Canada) IN: CASI Conference on Astronautics, 6th, Ottawa, Canada, Nov. 19-21, 1990, Proceedings. Ottawa, Canadian Aeronautics and Space Institute, 1990, p. 59-67. refs

A robotic tactile system for the active perception of three-dimensional objects surfaces which are larger than the tactile probe dimensions is studied. The local cutaneous data provided by a tactile sensor array is integrated with a robot arm's kinesthetic position parameters in such a way as to create a three-dimensional geometric model of the tactile sensor's 'pose' on the object surface to be explored; this is accomplished through the use of an instrumented passive-compliant wrist to attach the probe to the robot arm carrier. It is found that while a large tactile-sensing array will furnish a high degree of parallelism, its large rigid plane will touch fewer and higher peaks than a smaller array. O.C.

A91-34956#

A CONCEPT FOR A SUPERVISED AUTONOMOUS ROBOT

S. KALAYCIOGLU (Thomson-CSF Systems Canada, Inc., Nepean) IN: CASI Conference on Astronautics, 6th, Ottawa, Canada, Nov. 19-21, 1990, Proceedings. Ottawa, Canadian Aeronautics and Space Institute, 1990, p. 314-330. Canadian Space Agency-supported research. refs

A Telerobotics System Concept for the Mobile Servicing System (MSS) is introduced. Main functions of the telerobotics system include assembly and maintenance of the Space Station Freedom (SSF); loading/unloading from the Space Shuttle; and retrieval and deployment of the Shuttle. The functional responsibility division between an operator and the system is intended to provide an effective operational solution and to address the problems of time delays and bandwidth restrictions. Attention is also given to the functional and physical architectures of the system, the operational scenario for maintenance of the SSF, and the procedures for changing an Orbital Replacement Unit on the MSS or SSF. O.G.

A91-35153

PERFORMANCE MEASURES OF TELEOPERATION USING AN EXOSKELETON DEVICE

D. W. REPPERGER, S. J. REMIS (USAF, Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), and GARY MERRILL (Systems Research Laboratories, Inc., Dayton, OH) IN: 1990 IEEE International Conference on Robotics and Automation, Cincinnati, OH, May 13-18, 1990, Proceedings. Vol. 1. Los Alamitos, CA, IEEE Computer Society Press, 1990, p. 552-557. refs

Copyright

A study was conducted to evaluate performance of a man-machine interface system consisting of a human wearing a passive exoskeleton device. This experiment obtained some crude measures of human response characteristics treating the exoskeleton device as a complicated sensor array. A Fitt's law paradigm was used to help evaluate human performance. Fitt's law is commonly used in human performance studies and it characterizes human response in terms of speed-accuracy tradeoffs that occur as humans perform tasks. Empirical data were collected during tests involving five subjects run using five levels of speed-accuracy tasks. The results are analyzed. I.E.

A91-35154

STABILITY AND PERFORMANCE OF ROBOTIC SYSTEMS WORN BY HUMANS

H. KAZEROONI (Minnesota, University, Minneapolis) IN: 1990 IEEE International Conference on Robotics and Automation, Cincinnati, OH, May 13-18, 1990, Proceedings. Vol. 1. Los Alamitos, CA, IEEE Computer Society Press, 1990, p. 558-563. refs (Contract NSF EET-88-09088)

Copyright

The dynamics and control of robotic systems worn by humans are analyzed. General models for the human, the extender, and the interaction between the human and the extender are developed. The stability of the system of human, extender, and object being manipulated is analyzed, and the conditions for stable maneuvers are derived. An expression for the extender performance is defined to quantify the force augmentation. The tradeoff between stability and performance is described. The theoretical predictions are verified experimentally. I.E.

A91-35894

PARAMETRIC CLASSIFICATION OF SEGMENTS IN OCULAR NYSTAGMUS

CLAUDIO G. REY and HENRIETTA L. GALIANA (McGill University, Montreal, Canada) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. 38, Feb. 1991, p. 142-148. Research supported by NSERC and Fonds de Recherches en Sante du Quebec. refs

Copyright

A method for nystagmus classification that uses system identification techniques is presented. A system is formulated whose input is head position and whose output is eye position. This system is approximated with an autoregressive with exogenous input model which relates the input and output (transfer function) regardless of the temporal profile for the sensory stimulation. The system is then identified using a least squares criteria and three indicators are produced. From these a flag that marks slow and fast phases as well as blinks is produced. Bad data segment classification is remarkably insensitive to recording noise. The method is more robust than previous techniques. Operator intervention is minimal. The method should be applicable for all types of ocular nystagmus. Results are given in the context of the vestibuloocular reflex. How this method can be applied for optokinetic or pursuit nystagmus is discussed. I.E.

N91-21712# Federal Aviation Administration, Washington, DC.

NATIONAL PLAN FOR AVIATION HUMAN FACTORS, VOLUME 1

Nov. 1990 51 p Prepared in cooperation with Computer Technology Associates, Inc., Rockville, MD

(PB91-100339; PB91-100321) Avail: NTIS HC/MF A04; also available in set of 2 reports as PB91-100321 CSCL 05/8

The scope, objectives and an overview of the National Plan for Human factors is presented. The development of the plan, implementation and application to the National Aerospace System, the institutionalization of human factors and general recommendations are also discussed. Author

N91-21713# Federal Aviation Administration, Washington, DC.

NATIONAL PLAN FOR AVIATION HUMAN FACTORS, VOLUME 2

Nov. 1990 850 p Prepared in cooperation with Computer Technology Associates, Inc., Rockville, MD

(PB91-100347; PB91-100321) Avail: NTIS HC/MF A99; also available in set of 2 reports as PB91-100321 CSCL 05/8

Detailed descriptions of the technical agenda, the flightdeck plan, aircraft maintenance plan, airway facilities maintenance plan, air traffic control plan, and flightdeck/air traffic control plan are reported. Author

N91-21714*# Battelle Columbus Labs., Mountain View, CA.

HUMAN FACTORS IN AVIATION: TERMINAL CONTROL AREA BOUNDARY CONFLICTS

WILLIAM P. MONAN Feb. 1989 36 p

(Contract NAS2-11934)

(NASA-CR-177522; NAS 1.26:177522) Avail: NTIS HC/MF A03 CSCL 05/8

Air-to-air conflicts in the vicinity of Terminal Control Area (TCA) boundaries were studied to obtain a better understanding of the causal dynamics of these events with particular focus on human factor issues. The study dataset consisted of 381 Instrument Flight Rules/Visual Flight Rules (IFR/VFR) traffic conflicts in airspace layers above TCA ceiling and below TCA floors; 213 reports of incursions in TCA terminal airspace by VFR aircraft, of which 123 resulted in conflicts; and an additional set of reports describing problems with Air Traffic Control (ATC) services in and around TCAs. Results and conclusions are detailed. Author

N91-21715# Food and Agriculture Organization of the United Nations, Rome (Italy).

INTERNATIONAL DOCUMENT ON FOOD IRRADIATION

Jun. 1990 10 p Presented at the International Conference on Acceptance, Control of and Trade in Irradiated Foods, Geneva, Switzerland, 16-20 Dec. 1988 Presented in cooperation with World Health Organization, Geneva, Switzerland; International Atomic Energy Agency, Vienna, Austria; International TradeCentre UNCTAD/GATT, Geneva, Switzerland; and Atomic Energy Commission, Damascus, Syria (DE91-615879; AECS/IB-4; CONF-881204) Avail: NTIS HC/MF A02

This international document highlights the major issues related to the acceptance of irradiated food by consumers, governmental and intergovernmental activities, the control of the process, and trade. The conference recognized that: Food irradiation has the potential to reduce the incidence of foodborne diseases. It can reduce post-harvest food losses and make available a larger quantity and a wider variety of foodstuffs for consumers. Regulatory control by competent authorities is a necessary prerequisite for introduction of the process. International trade in irradiated foods would be facilitated by harmonization of national procedures based on internationally recognized standards for the control of food irradiation. Acceptance of irradiated food by the consumer is a vital factor in the successful commercialization of the irradiation process, and information dissemination can contribute to this acceptance. DOE

N91-21716# Logicon Technical Services, Inc., Dayton, OH.

A COMPATIBILITY ASSESSMENT OF THE PROTECTIVE INTEGRATED HOOD MASK WITH ANVIS NIGHT VISION GOGGLES Final Report, Jan. - Mar. 1990

MARY M. DONOHUE-PERRY Jul. 1990 31 p (Contract F33615-89-C-0532)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

(AD-A229956; AAMRL-TR-90-030) Avail: NTIS HC/MF A03
CSCL 05/8

Potential compatibility problems found with the Protective Integrated Hood Mask (PIHM) and the Aviator's Night Vision Imaging System (ANVIS) were evaluated. The PIHM is worn under a standard HGU-55/P helmet and is designed to protect USAF aircrew members in a chemical environment. Visual acuity through ANVIS/PIHM, ANVIS horizontal and vertical intensified of view while wearing PIHM, and distortion and transmissivity of the PIHM visor were determined. Acuity through ANVIS with and without PIHM was assessed under quarter moon and starlight illumination. Acuity was tested using 20 and 90 percent contrast Landolt C targets depicted in one of four orientations. ANVIS/PIHM viewing resulted in acuity reductions of approximately 6 percent for both contrast levels at quarter moon illumination. No acuity loss was present at starlight illumination. Tests of horizontal and vertical ANVIS intensified fields of view resulted in no significant losses when PIHM was donned. GRA

N91-21717# Air Force Occupational and Environmental Health Lab., Brooks AFB, TX.

RECOMMENDED CARBON DIOXIDE AND RELATIVE HUMIDITY LEVELS FOR MAINTAINING ACCEPTABLE INDOOR AIR QUALITY Final Report

DAVID CARPENTER and BRUCE J. POITRAST Oct. 1990
35 p

(AD-A230026; AFOEHL-90-169CA00111KGA) Avail: NTIS
HC/MF A03 CSCL 06/9

At the request of the AFLC Surgeon, AFOEHL prepared a recommendation for carbon dioxide and relative humidity levels to maintain adequate indoor air quality. The report summarizes and analyzes the results of approximately 75 building investigations and makes recommendations for controlling indoor air quality by use of carbon dioxide levels. The report discusses the symptoms and signs found in occupants and the possible causes for same. A draft of this report was previously released under the title, Proposed Indoor Air Quality Standard for AFLC/SG, Oct. 90 AFOEHL Report number 90-169CA00111KGA. GRA

N91-21718# Logicon, Inc., Dayton, OH.

A FIELD EVALUATION OF THE COMPATIBILITY OF THE PROTECTIVE INTEGRATED HOOD MASK WITH ANVIS NIGHT VISION GOGGLES Final Report, Jan. - Mar. 1990

JOSEPH T. RIEGLER and MARY M. DONOHUE-PERRY Jul. 1990 25 p

(Contract F33615-89-C-0532)

(AD-A230237; AAMRL-TR-90-031) Avail: NTIS HC/MF A03
CSCL 17/5

An evaluation was conducted to determine potential compatibility problems found while wearing the Protective Integrated Hood Mask (PIHM) with the Aviator's Night Vision Imaging Systems (ANVIS). The PIHM is worn under a standard HGU-55/P helmet and is designed to protect USAF aircrew members in a chemical environment. ANVIS is mounted in the front of the PIHM visor using a special bracket. The evaluation consisted of tests performed at Pope AFB, NC using qualified C-130E crewmembers. Examinations of horizontal and vertical intensified fields of view, cockpit lighting capability, and a limited fit evaluation were conducted. Testing showed that ANVIS/PIHM viewing resulted in average losses of horizontal and vertical fields of view of 2.6 and 2.1 deg. C-130E cockpits lighting interference was not found when viewing through the AVIS/PIHM, or under the ANVIS through the PIHM visor. No significant problems in achieving proper fit with ANVIS/PIHM were found. Overall conclusions were that potential compatibility problems of ANVIS and PIHM integration can be reduced or eliminated with proper fit and adjustment of the ANVIS/PIHM. GRA

N91-21719# Naval Air Development Center, Warminster, PA. Air Vehicle and Crew Systems Technology Dept.

VENTILATION LOSS AND PRESSURIZATION IN THE NASA LAUNCH/ENTRY SUIT: POTENTIAL FOR HEAT STRESS Final Report, 1 Aug. - 15 Sep. 1989

JONATHAN W. KAUFMAN, KATHERINE Y. DEJNEKA, and GREGORY K. ASKEW 15 Sep. 1989 21 p Sponsored by NASA, Johnson Space Center
(NASA-CR-188075; REPT-387929; NAS 1.26:188075; AD-A230318; NADC-90069-60) Avail: NTIS HC/MF A03 CSCL 06/11

The potential of the NASA Launch/Entry Suit (LES) for producing heat stress in a simulated Space Shuttle cabin environment was studied. The testing was designed to identify potential heat stress hazards if the LES were pressurized or if ventilation were lost. Conditions were designed to simulate an extreme pre-launch situation with chamber temperatures maintained at dry bulb temperature = 27.2 ± 0.1 C, globe temperature = 27.3 ± 0.1 C, and wet bulb temperature = 21.1 ± 0.3 C. Two females and two males, 23 to 34 years of age, were employed in this study, with two subjects having exposures in all 3 conditions. Test durations in the ventilated (V) and unventilated (UV) conditions were designed for 480 minutes, which all subjects achieved. Pressurized runs (Pr) were designed for 45 minutes, which all subjects also achieved. While some significant differences related to experimental conditions were noted in rectal and mean skin temperatures, evaporation rates, sweat rates, and heart rate, these differences were not thought to be physiologically significant. The results indicate that the LES garment, in either the Pr or UV state, poses no danger of inducing unacceptable heat stress under the conditions expected within the Space Shuttle cabin during launch or reentry. GRA

N91-21720# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerospace Medical Panel Working Group 14.

HIGH G PHYSIOLOGICAL PROTECTION TRAINING

1991 98 p

(AGARD-AG-322; ISBN-92-835-0596-4) Copyright Avail: NTIS
HC/MF A05; Non-NATO Nationals requests available only from
AGARD/Scientific Publications Executive

High-G physiological protection training is currently of importance to NATO Air Force operations because of a deficiency in g protection methods. This deficiency can, and on occasion does, result in G-induced Loss of Consciousness (G-LOC). Consequently, these methods are supported and supplemented by increasing their effectiveness through: increased understanding of the physiologic basis of g protection; development of advanced g protection concepts; knowledge of the system and basis of G-LOC; identification of the existence and location of human use centrifuges in NATO countries; increased physical conditioning; improved training of pilots on the centrifuge; and establishment of training goals and standards. These topics are addressed at a scientific or technical level of knowledge that is possessed by everyone involved in acceleration research, g training, flying, or designing and building high performance aircraft. At the end of each chapter is a brief summary in both English and French.

Author

N91-21721# Army Natick Labs., MA.

THE EFFECTS OF CHEMICAL PROTECTIVE GLOVES AND GLOVE LINERS ON MANUAL DEXTERITY Final Technical Report, Dec. 1988 - Jan. 1990

RICHARD A. TEIXEIRA and CAROLYN K. BENSEL Dec. 1990
47 p

(AD-A231250; NATICK/TR-91/002) Avail: NTIS HC/MF A03
CSCL 15/6

The effect were determined on manual dexterity performance of two thickness of butyl, chemical protective gloves, 0.64 mm and 0.36 mm, and of two types of cotton glove liners, a seam-stitched and a stinknit version. Over seven working days, 12 male subjects performed three, fine-finger dexterity tests while bare handed and while wearing each of the four glove and liner combinations. The subjects also completed a questionnaire designed to elicit their opinions of the handwear. Analyses of the subjects' times to test completion with the glove and liner combinations, expresses as a percentage of bare hand times, failed to yield any significant interactions among the glove, the

liner, and testing session variables. Also, the main effect of liner type did not reach significance, but the main effects of glove and of session did. The subjects' performance improved across sessions and was better when the 0.36-mm gloves were torn than when the 0.64-mm gloves were used. Although the subjects expressed a definite preference for the thinner butyl gloves, they did not consistently choose one cotton liner as being superior to the other. When forced to select the one liner that they preferred, 8 of 12 subjects chose the string-knit version. GRA

N91-21722# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA.

HUMAN PERFORMANCE CONCERNS FOR THE TRACKWOLF SYSTEM Final Report, Jan. 1989 - Jan. 1990

BEVERLY G. KNAPP and MARY J. HALL Dec. 1990 33 p (AD-A231359; ARI-RN-91-14) Avail: NTIS HC/MF A03 CSCL 05/8

Findings are presented from site visits to two operational systems (OUTS and TRACKFINDER), which are predecessors to the objective TRACKWOLF system under development. The purpose of the site visits was to obtain lessons learned, operator workload estimates, and critical high-driver tasks. These data were used as a baseline for comparing operator capabilities and as a precursor to use in TRACKWOLF operational tests. Findings indicated significant frustration with equipment operations and communication capability of OUTS and TRACKFINDER. This was also revealed by a high rating on the workload scale (NASA-Task Load Index) on frustration and temporal demand subfactors. Over 50 pct. of the tasks were judged high workload and difficult cognitive load for operators. Results have been provided to proponent combat developer and trainer personnel. GRA

N91-21723# Naval Postgraduate School, Monterey, CA.

A TOOLKIT FOR DESIGNING USER INTERFACES M.S. Thesis

SUSAN L. DUNLAP Mar. 1990 77 p (AD-A231558) Avail: NTIS HC/MF A05 CSCL 12/5

Current methods of developing user interfaces for IRIS workstation application programs are inefficient. In order to help speed the development of complex graphics programs, IRIS workstation users need a toolkit that will assist in the design and implementation of user interfaces for graphics programs. This project presents the preliminary work on an interface generator for the Silicon Graphics, Inc. IRIS workstation. The NPS Interface Builder (NPS IB) is designed to speed the creation of application programs by allowing a user to define an interface graphically rather than by writing C code. The program provides on-screen editing, facilitated by a number of program features. NPS IB can be used to develop the basic framework of a graphics program, or can be user to enhance the capabilities of an already existing graphics application. GRA

N91-22249# MATRA Espace, Toulouse (France).

KNOWLEDGE BASED FRAMEWORK FOR MAN-SYSTEM INTERACTION IN SPACE CONTROL CENTRES

FRANCOISE CARRE, PASCAL RICHARD, NATHALIE CARN, and NATHALIE AUSSINAC (Centre National de la Recherche Scientifique, Toulouse, France) In ESA, Ground Data Systems for Spacecraft Control p 373-378 Oct. 1990

Copyright Avail: NTIS HC/MF A99

An object oriented approach used in developing a model of controlled systems, both in spacecraft and in ground segments is discussed. This model is to be used as a kernel for a variety of applications based on artificial intelligence techniques. Operations within a space control center that can be improved by artificial intelligence techniques are outlined. A model based approach for artificial intelligence presupposes emphasis being placed on the knowledge acquisition step. The integration of artificial intelligence techniques in the operational environment is discussed. ESA

N91-22270# Computer Resources International A/S (Denmark). Space Div.

THE DESIGN OF ERROR TOLERANT INTERFACES

ERIK HOLLNAGEL In ESA, Ground Data Systems for Spacecraft Control p 511-514 Oct. 1990

Copyright Avail: NTIS HC/MF A99

The principles involved in the design of Error Tolerant Interfaces (ETI) are outlined. An ETI is characterized as being robust against the disturbances and inaccuracies of man machine interaction that may result from temporary capacity reduction of the operator and from impediments of human reliability in general. An ETI is able to absorb and compensate for degraded input and to provide output in a form of presentation which can be interpreted correctly even under suboptimum working conditions. This is significant in the case of work under stressed conditions or high time pressures, on the ground or in orbit, as a countermeasure to the adverse effects of reduced human reliability. ESA

N91-22281# VEGA Space Systems Engineering Ltd., Saint-Albans (England).

MAN-MACHINE INTERFACE (MMI) ASPECTS OF WORKSTATIONS FOR USE IN SPACECRAFT OPERATIONS

ROGER S. THOMPSON In ESA, Ground Data Systems for Spacecraft Control p 577-582 Oct. 1990

Copyright Avail: NTIS HC/MF A99

Modern engineering workstation computers, with multiple high resolution color monitors, employing multiwindow software to manage the organization of the display, provide an ideal platform for the implementation of spacecraft monitoring and control systems. The prototype Meteosat advanced operations workstation which demonstrates many of the man-machine interface features which such a system can provide, including interactive graphical status displays, is described. The user interface draws together the requirements of the online tasks performed by spacecraft operators and the offline analysis functions performed by spacecraft engineers, enabling a single system to support both classes of user. ESA

N91-22282*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

DEVELOPING A USER-INTERFACE-EVALUATION TOOL FOR SPACE-STATION-ERA APPLICATIONS

SHARI A. BAHDER, ELIZABETH D. MURPHY (Computer Technology Associates, Inc., Rockville, MD.), SYLVIA B. SHEPPARD, and WALTER TRUSZKOWSKI In ESA, Ground Data Systems for Spacecraft Control p 583-587 Oct. 1990 (Contract NAS5-30680)

Copyright Avail: NTIS HC/MF A99 CSCL 05/8

The development of progressively more intelligent interface design aids is described. The first generation of the Computer Human Interaction Models (CHIMES) methodology and toolset identifies trouble spots in an existing or proposed design. The second generation, CHIMES-2, provides the designer with intelligent assistance in formulating modifications to correct identified problems. The approaches used in development of the CHIMES-2 capabilities and knowledge bases are outlined. Implementation of the phase 1 prototype is described. Future directions include integration with other design tools, implementation of a design library, and further theoretical work. The final objective of the research and development effort is a total workstation environment for the designer of computer human interfaces for spacecraft control. ESA

N91-22283# INTECS Toscana S.R.L., Pisa (Italy).

THE SCOS MAN-MACHINE INTERFACE PROJECT

PAOLO COPPOLA and BRUNO MULLET (European Space Agency. European Space Operations Center, Darmstadt, Germany, F.R.) In ESA, Ground Data Systems for Spacecraft Control p 589-595 Oct. 1990

Copyright Avail: NTIS HC/MF A99

The software infrastructure developed for the management of the man-machine interface of the Spacecraft Control and Operation System (SCOS) over a network of workstations is described. The software provides multimission facilities for the configuration management of the desktops of user categories, for privileges and activities monitoring and control, for data presentation and

user input interpretation and for handling distributed applications. The facilities ease the implementation integration and operation activities of the man-machine interface designers and application programmers of the spacecraft control systems and guarantee a standard 'look and feel' for end users. ESA

N91-22284# Marcol Computer Systems Ltd., Darmstadt (Germany, F.R.).

MSCC CONSOLE DEMONSTRATOR PROJECT

P. HALL and M. DREXLER (Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen, Germany, F.R.) /n ESA, Ground Data Systems for Spacecraft Control p 597-600 Oct. 1990

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The Columbus ground data systems will employ a number of new technologies including advanced graphical user interfaces, networked workstations and Ada. Each of these new technologies present new challenges to engineers and managers. In order to reduce the technical risk and to control life cycle costs, a pilot project is proposed to develop a control room demonstration console. The Manned Space Laboratories Control Center (MSCC) console demonstrator is a prototype of the console to be used in the MSCC ground data system during Columbus. It has two-operator positions with access to the existing MSCC voice, video and timing facilities. The console workstations are networked to a simulator which will generate telemetry data for display at the Console demonstrator Man Machine Interface (MMI). Development of the MSCC console demonstrator provides important information about the MMI and networking design. It also serves as a testbed for new technologies. ESA

N91-22712# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.

A COMPARISON OF HUMAN-COMPUTER INTERFACES IN AIR FORCE ORGANIZATIONS M.S. Thesis

MICHAEL G. MORRIS Dec. 1990 140 p (AD-A229708; AFIT/GIR/LSM/90D-7) Avail: NTIS HC/MF A07 CSCL 23/2

This thesis investigated differences in organizational efficiency and effectiveness for users of graphical user interfaces and text-based interfaces on personal computers in Air Forces offices. Areas of interest included amount of time required to learn the basic system, amount of time required to learn new application, users' ratings of user-friendliness, users' perceptions of the extent that their system help them perform in their job, the number of software packages used on the job by users of each system, user satisfaction, responsible authorities' ratings of quality of output, and the relationship between user job experience level and interface used on the job. A literature review revealed no similar studies within the Department of Defense to date. Two populations across two organizations were identified for survey administration--users of graphical user interfaces and users of text-based interfaces. A total of 700 surveys were out with 454 returned for a response rate of 64.9 percent. The results of the study indicated that for the organizations surveyed, graphical user interfaces offer significant advantages in each of the areas investigated. Finally, the results of the study revealed that less experienced users tend to use graphical interfaces over text-based systems in greater numbers while civilian users were more likely to use text-based systems. GRA

N91-22713# Bristol Univ. (England). Dept. of Aerospace Engineering.

MILITARY AIR CREW HELMET DESIGN STUDY B.S. Thesis

A. P. FOLEY and G. R. MCILFATRICK Jun. 1990 48 p (BU-502; ETN-91-99195) Avail: NTIS HC/MF A03

Many current aircrew flying helmets are considered unsatisfactory by their users. By circulating a questionnaire among aircrew, a new specification was produced with the emphasis placed on their opinions and wishes. Apart from comfort criteria, fast jet and helicopter aircrew require differing helmet designs. For helicopter aircrew, protection and noise reduction are of greatest importance. Fast jet aircrew require above all a helmet which will

not adversely affect their lookout capability either due to bulk, balance, weight, or field of view obstruction. In their opinion, protection is not of paramount importance. Helmet mounted systems are accepted as an operational requirement but present methods are considered unsatisfactory and system integration is a necessity. ESA

N91-22714 Tel-Aviv Univ. (Israel). Dept. of Interdisciplinary Studies.

AUTOMATED ANALYSIS OF FOOT-GROUND PRESSURE PATTERNS M.S. Thesis

ARIE ROSENGART Sep. 1988 103 p (ITN-91-85092) Copyright Avail: Tel-Aviv Univ., Exact Sciences Library, Ramat Aviv 69978, Israel

The Footprint instrument, which uses an optical interference sandwich to elucidate underfoot pressure distribution, provides a pictorial representation of the data; a measurement process is needed to determine the load forces numerically. This project aimed to develop a computerized, online image processing system for Footprint instrumental data, and to develop tools for offline analysis of foot ground-pressure (FGP) patterns, as related to foot structure. The processing algorithms were designed with particular attention to computation time economy. The main process implements image processing methods for the measurement of the interference fringes which form the FGP pattern. Appropriate conversion rules enabled these measurements to be translated into force; from the force distribution are computed the parameters which determine the foot-structure characteristics. To avoid the need to locate the centers of the approximately 150 fringes forming the FGP pattern, the system acquires an apriori knowledge of the standing plate and applies it during the measurement process. This approach reduced the measurement time for each pattern below 30 seconds, during which the following parameters are computed: force distribution; total load; load on each foot; contact area; average pressure; longitudinal arch; load and stress ratio for the forefeet and heels; and the points of peak load at the heels (sharpness). A utility program provides offline computation of the following additional parameters: FGP centroid; centroid of each foot or of any FGP segment; and average pressure in a selected segment. ISA

N91-23029*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

DIRECTION DISCRIMINATING HEARING AID SYSTEM

M. JHABVALA, H. C. LIN, and G. WARD (Design Three, Inc., Oxon Hill, MD.) /n National Aeronautics and Space Administration, Technology 2000, Volume 1 p 66-72 Mar. 1991 Avail: NTIS HC/MF A18 CSCL 05/8

A visual display was developed for people with substantial hearing loss in either one or both ears. The system consists of three discreet units; an eyeglass assembly for the visual display of the origin or direction of sounds; a stationary general purpose noise alarm; and a noise seeker wand. Author

N91-23065*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Robotic Hardware and Flight Experiments Group.

DIVERSE APPLICATIONS OF ADVANCED MAN-TELEROBOT INTERFACES

DOUGLAS A. MCAFFEE /n National Aeronautics and Space Administration, Technology 2000, Volume 1 p 350-360 Mar. 1991

Avail: NTIS HC/MF A18 CSCL 05/8

Advancements in man-machine interfaces and control technologies used in space telerobotics and teleoperators have potential application wherever human operators need to manipulate multi-dimensional spatial relationships. Bilateral six degree-of-freedom position and force cues exchanged between the user and a complex system can broaden and improve the effectiveness of several diverse man-machine interfaces. Author

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SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

A91-35941* Salk Inst. for Biological Studies, San Diego, CA.
**ORIGIN OF FATTY ACID SYNTHESIS - THERMODYNAMICS
 AND KINETICS OF REACTION PATHWAYS**

ARTHUR L. WEBER (Salk Institute for Biological Studies, San Diego, CA) Journal of Molecular Evolution (ISSN 0022-2844), vol. 32, 1991, p. 93-100. refs
 (Contract NAGW-2097; NSG-7627)
 Copyright

The primitiveness of contemporary fatty acid biosynthesis was evaluated by using the thermodynamics and kinetics of its component reactions to estimate the extent of its dependence on powerful and selective catalysis by enzymes. Since this analysis indicated that the modern pathway is not primitive because it requires sophisticated enzymatic catalysis, an alternative pathway of primitive fatty acid synthesis is proposed that uses glycolaldehyde as a substrate. In contrast to the modern pathway, this primitive pathway is not dependent on an exogenous source of phosphoanhydride energy. Furthermore, the chemical spontaneity of its reactions suggests that it could have been readily catalyzed by the rudimentary biocatalysts available at an early stage in the origin of life. Author

A91-35947* National Aeronautics and Space Administration.
 Ames Research Center, Moffett Field, CA.

PREBIOTIC CHEMISTRY IN CLOUDS

VERNE R. OBERBECK (NASA, Ames Research Center, Moffett Field, CA), JOHN MARSHALL (Arizona State University, Tempe), and THOMAS SHEN (SETI Institute, Moffett Field, CA) Journal of Molecular Evolution (ISSN 0022-2844), vol. 32, 1991, p. 296-303. refs
 Copyright

The chemical evolution hypothesis of Woese (1979), according to which prebiotic reactions occurred rapidly in droplets in giant atmospheric reflux columns was criticized by Scherer (1985). This paper proposes a mechanism for prebiotic chemistry in clouds that answers Scherer's concerns and supports Woese's hypothesis. According to this mechanism, rapid prebiotic chemical evolution was facilitated on the primordial earth by cycles of condensation and evaporation of cloud drops containing clay condensation nuclei and nonvolatile monomers. For example, amino acids supplied by, or synthesized during entry of meteorites, comets, and interplanetary dust, would have been scavenged by cloud drops containing clay condensation nuclei and would be polymerized within cloud systems during cycles of condensation, freezing, melting, and evaporation of cloud drops. I.S.

N91-22715*# National Aeronautics and Space Administration,
 Washington, DC.

**PUBLICATIONS OF THE EXOBIOLGY PROGRAM FOR 1989:
 A SPECIAL BIBLIOGRAPHY**

Mar. 1991 59 p Prepared in cooperation with George Washington Univ., Washington, DC
 (Contract NASW-4324)
 (NASA-TM-4269; NAS 1.15:4269) Avail: NTIS HC/MF A04
 CSCL 06/3

A listing of 1989 publications resulting from research supported by the Exobiology Program is presented. Research supported by the Exobiology Program is explored in the following areas: (1) cosmic evolution of biogenic compounds; (2) prebiotic evolution; (3) early evolution of life; (4) and evolution of advanced life. Pre-mission and pre-project activities supporting these areas are supported in the areas of solar system exploration and search for extraterrestrial intelligence. The planetary protection subject area is included here because of its direct relevance to the Exobiology Program. Author

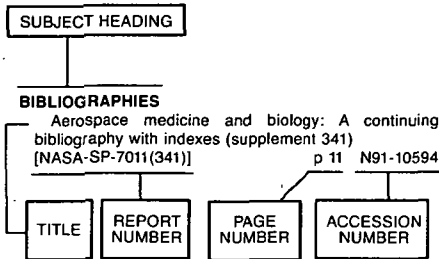
N91-22716*# National Aeronautics and Space Administration.
 Ames Research Center, Moffett Field, CA.

DEVELOPMENTAL ADAPTATIONS TO GRAVITY IN ANIMALS

ALAN R. HARGENS Feb. 1991 23 p
 (NASA-TM-102228; A-89232; NAS 1.15:102228) Avail: NTIS
 HC/MF A03 CSCL 06/2

Terrestrial animals have adapted to a constant gravitational stress over millions of years. Tissues of the cardiovascular system and lumbar spine in tall species of animals such as the giraffe are particularly well adapted to high and variable vectors of gravitational force. Swelling of the leg tissues in the giraffe is prevented by a variety of physiological mechanisms including (1) a natural 'antigravity suit', (2) impermeable capillaries, (3) arterial-wall hypertrophy, (4) variable blood pressures during normal activity, and (5) a large-capacity lymphatic system. These adaptations, as well as a natural hypertension, maintain blood perfusion to the giraffe's brain. The intervertebral disk is another tissue that is uniquely adapted to gravitational stress. Tall and large terrestrial animals have higher swelling pressures than their smaller or aquatic counterparts. Finally, the meniscus of the rabbit knee provides information on the effects of aging and load-bearing on cartilaginous tissues. Such tissues within the joints of animals are important for load-bearing on Earth; these connective tissues may degenerate during long-duration space flight. Author

Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of document content, a title extension is added, separated from the title by three hyphens. The accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence.

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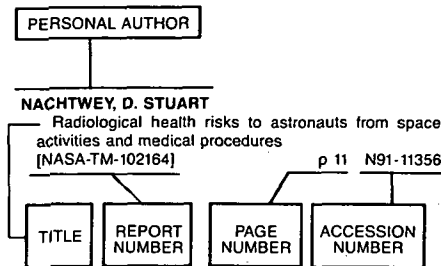
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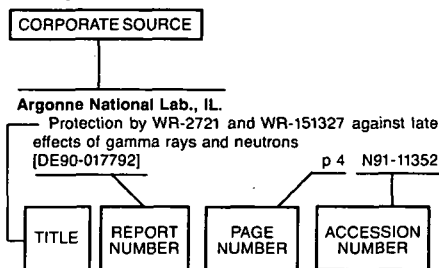
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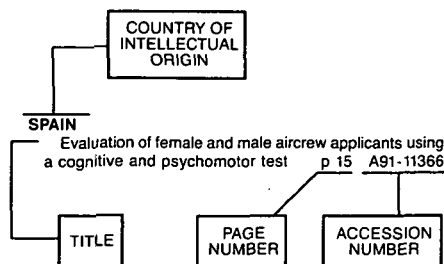
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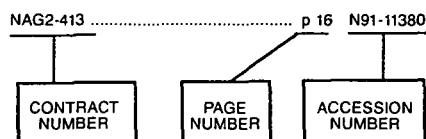
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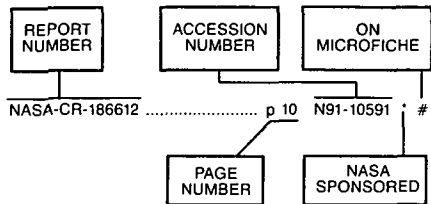
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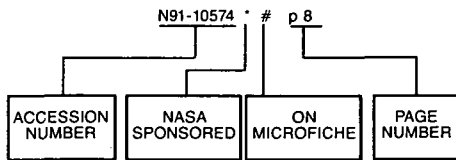
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